the OIL AND GAS JOURNAL

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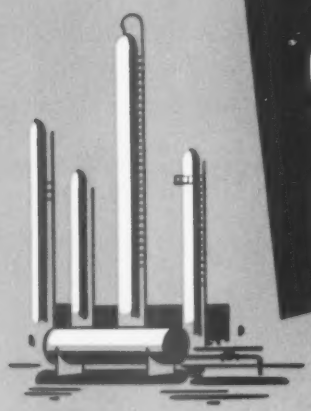

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ISO-BUTANE
BUTANE
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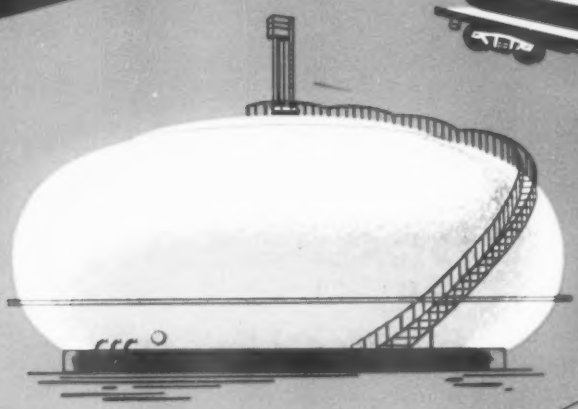
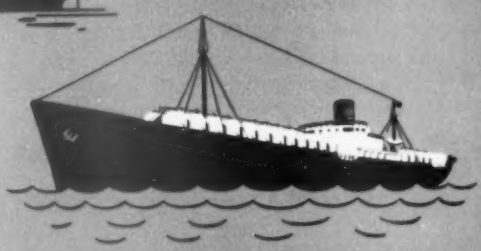


NORMAL PENTANE
HEXANE
HEPTANE
HEAVY NAPHTHA
STA-VOL-ENE



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In Brief . . .

1. BETTER OIL RECOVERY . . . It is estimated that water flooding the upper three of the four sand reservoirs in the Healdton field would increase efficiency in recovering mobile oil from about 50 to approximately 80 per cent. Solution-gas expansion was the displacement mechanism in these upper reservoirs at the start of production. About one-half of the original mobile oil (422 million barrels) had been recovered by January 1, 1951, principally by primary production. Some gas injection and vacuum application were used.

•

2. DRILL-STEM TESTING . . . Full-hole testing has been used in 90 per cent of Williston basin formations, with double packers frequently being used. About 90 per cent of Uintah basin tests are full-hole. Double packers are used 9 out of 10 times. Considerable rathole testing has been done in the Colorado portion of the Denver-Julesburg basin; otherwise use of double packers in a full hole is generally successful. Both rathole and full-hole tests are employed successfully in the Big Horn basin.

•

3. AUTOMATIC BOOSTERS . . . Lower operating cost, with resultant quick payout, is behind the development of the automatic, completely unattended booster station. Entire operation of Phillips' Boise City booster is through a remotely controlled telephone dialing system located at McKee station (the next upstream station). By dialing assigned numbers, operator may (1) start both units, (2) stop both units, (3) monitor unit No. 1, (4) monitor unit No. 2, and (5) monitor oil level.

4. UPGRADING CYCLE STOCK . . . Furfural extraction of cycle stock for a catalytic cracking unit enables the refiner to increase the virgin charge capacity of the unit substantially, with a significant increase in percentage yield of catalytic gasoline. Coke-burning requirement for unit is reduced, poly gasoline production is increased, and cat cracker investment per barrel of daily virgin charge capacity is reduced.

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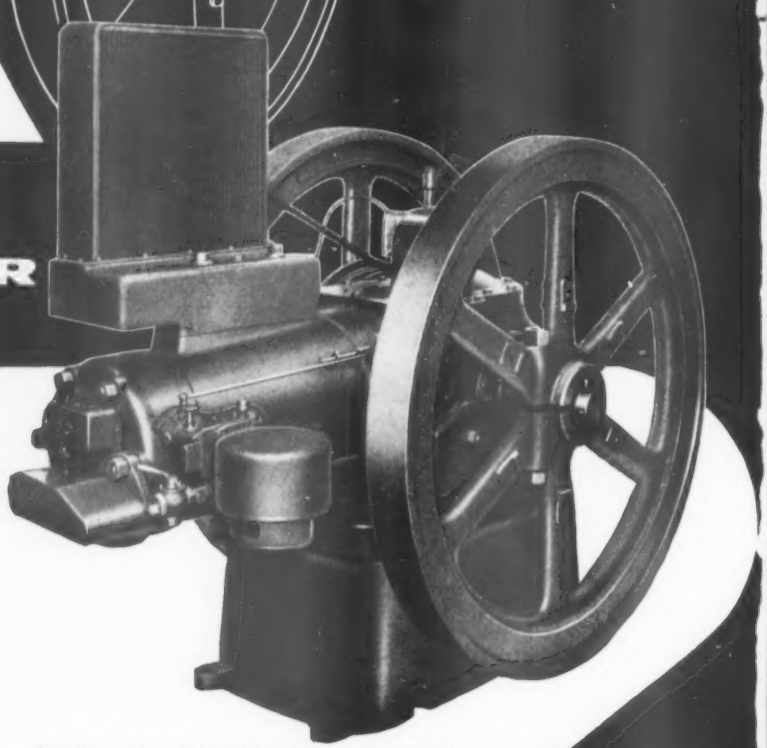
5. MORE PETROCHEMICALS . . . Koppers Co., Inc., synthesizes ethylbenzene by the Friedel-Crafts reaction from ethylene and benzene as basic raw materials at its Port Arthur plant. Ethylene is supplied by Gulf's recently completed ethylene plant at Port Arthur, while benzene is obtained from coke plants in the south and east.

THIS BALANCE ...IS IN YOUR FAVOR



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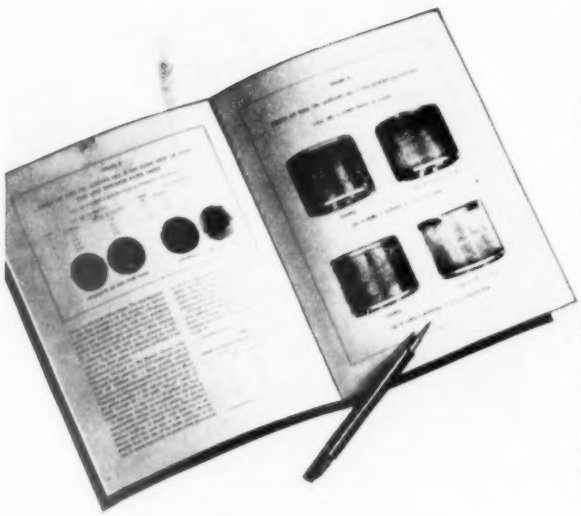

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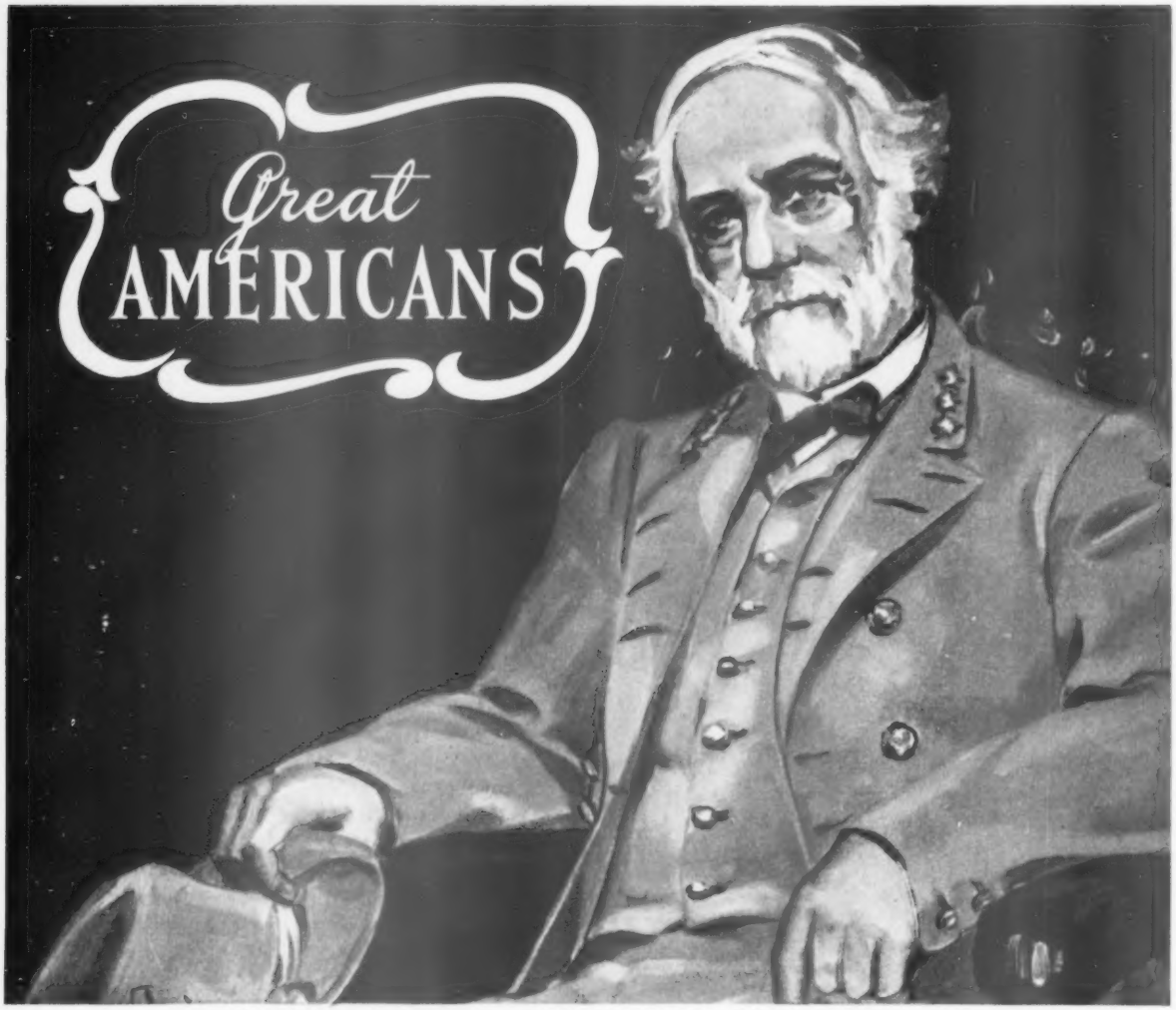

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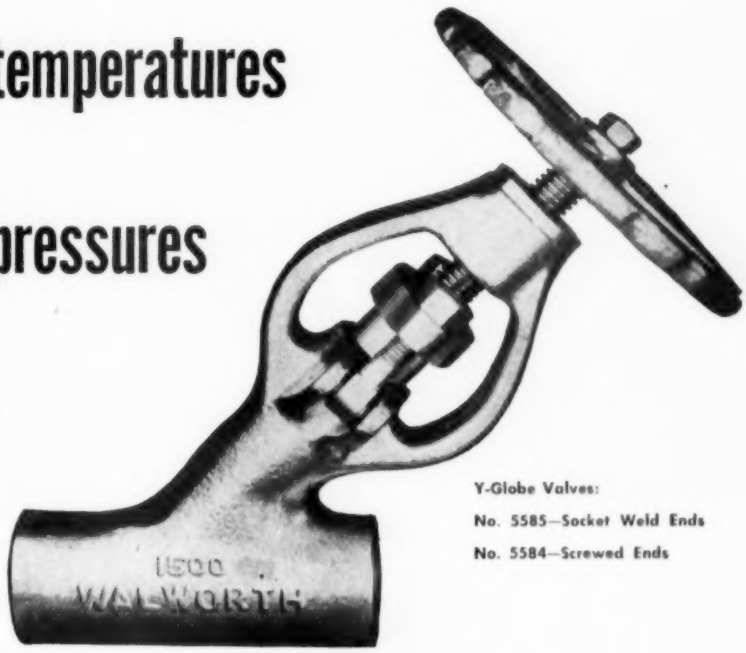

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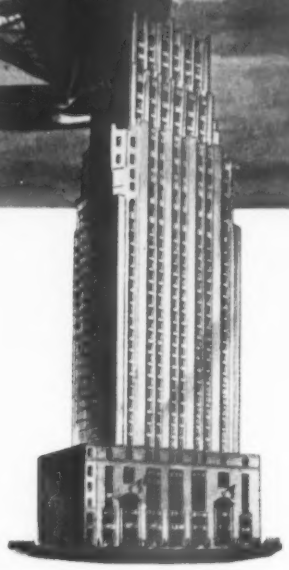

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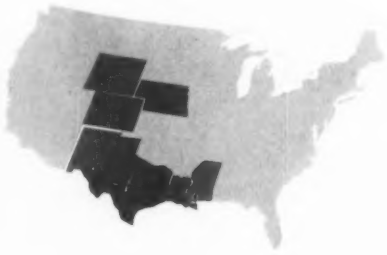

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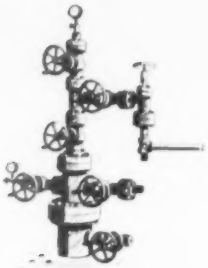

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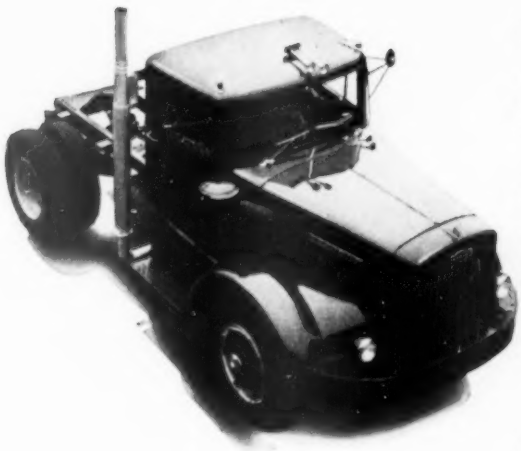

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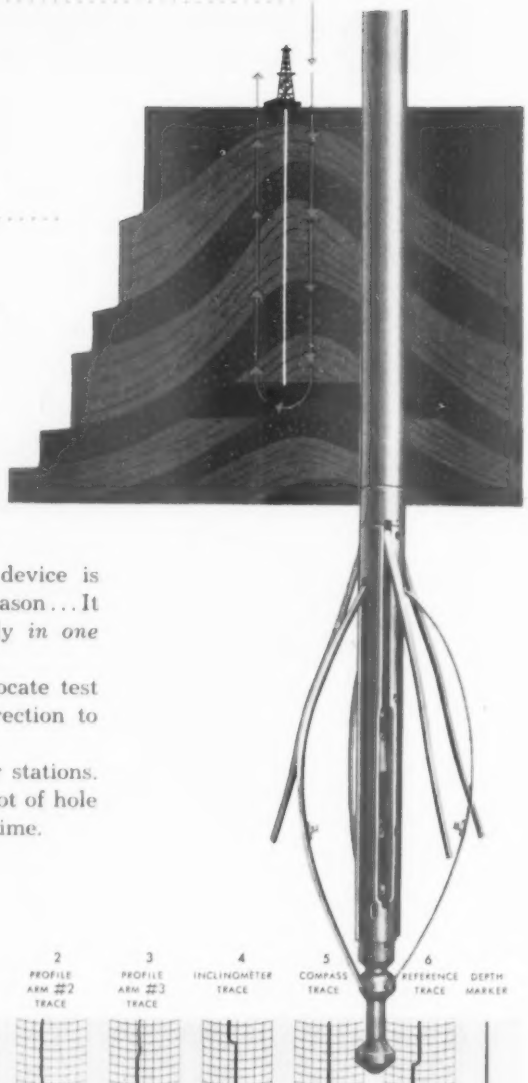

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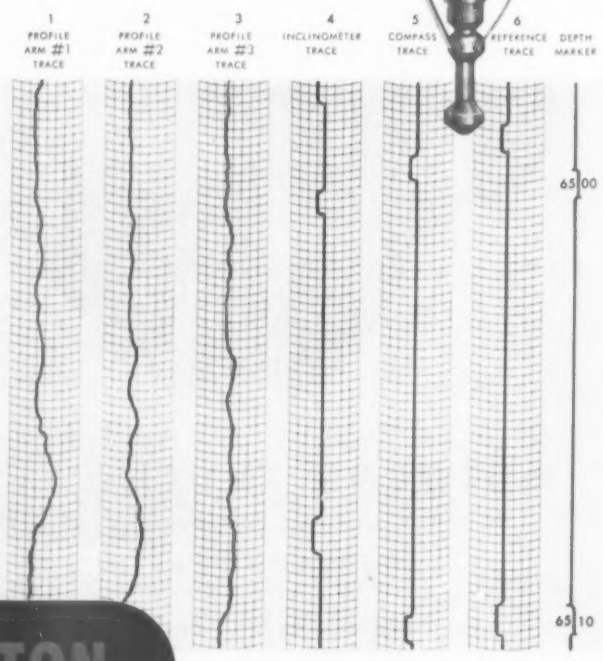

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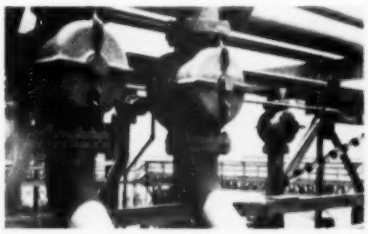

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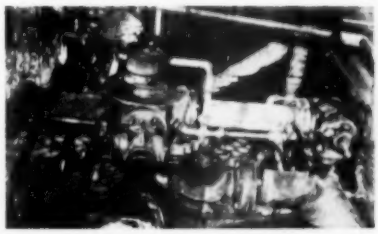

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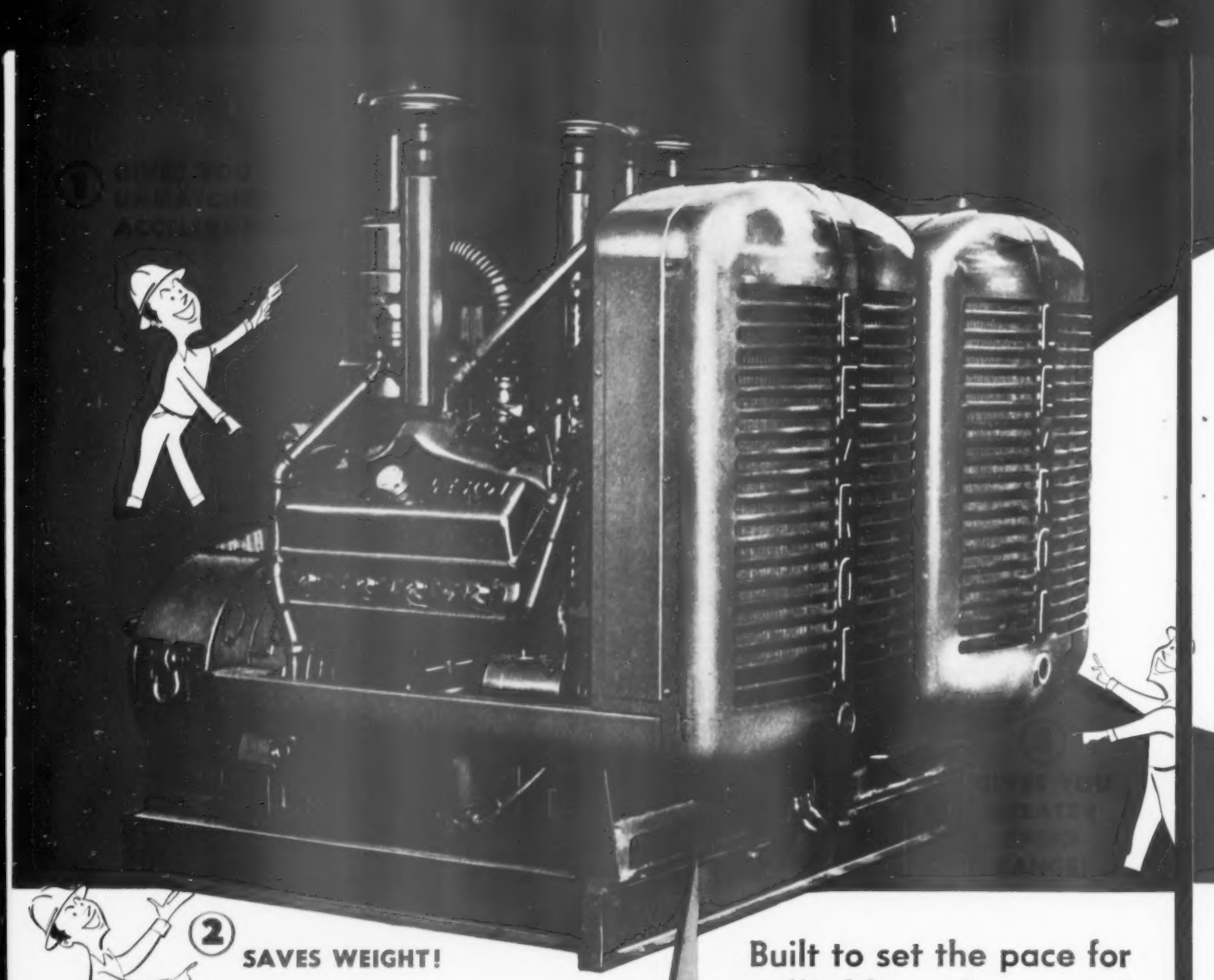
Write for Catalog 4-OG, American Car and Foundry Company, Valve Division, 1501 E. Ferry Ave., Detroit 11, Michigan

Representatives in 50 Principal Cities



Le Roi H540 Twin provides continuous heavy-duty service over a wide range of speeds up to 2000 rpm — burning butane, gasoline, or natural gas.

Built to set the pace for *profitable performance!*

Valve-in-head design puts maintenance locations out in open — reduces idle time and labor costs.

Removable wet-cylinder sleeves last longer — can be replaced at a fraction of the cost of reboring the block.

Cam-ground aluminum pistons have full-floating piston pins — minimize vibration — improve efficiency — maintain correct cylinder-wall contact under all operating conditions.

Gear-driven water pump provides dependable circulation under all conditions.

Extra-heavy counterweighted forged crankshaft reduces vibration.

Full-pressure oiling system provides full lubrication under pressure to all vital engine parts.

Water-cooled manifolds make for safer, cooler operation.

Unit construction of crankcase and cylinder block provides the rigidity necessary to withstand the strains and stresses of rough handling.

New Le Roi H540 260-hp Twin

...has 4-way advantage over a single engine with same power output!

Ideal for truck-mounted rigs. Helps you keep overall width and weight within road limits.

YES, sir, there's more difference than just appearance between a single 260-hp engine and this Le Roi H540 V-8 Twin. Look how it stacks up against other makes:

1. **It's more compact!** Only 71⅞" long, with air clutch (74⅛", with mechanical clutch) and only 70¼" wide. You stay within size limitations.
2. **It gives you greater speed range!** 700 rpm to 2000 rpm.
3. **It gives you outstanding acceleration!** You get lightning-fast response to load demand.
4. **It weighs only 6700 lbs.!** You stay within weight limitations.
5. **Ratios available at power take-off:** 1-1, 1½-1, 2-1.

You can buy this new H540 Twin with full confidence of getting all the dependability, economy, and stamina that oil men have come to expect of any Le Roi. Ask your Le Roi distributor or supply house to show you the H540 Twin — the last word in oilfield power.

LE ROI

LE ROI COMPANY

MILWAUKEE 14, WISCONSIN

Plants: Milwaukee • Cleveland • Greenwich, Ohio

Oil Field Headquarters: Tulsa, Oklahoma

Service — as Near as Your Telephone

Complete parts stocks . . . Skilled mechanics on 24-hour call . . . Unexcelled overhaul facilities.

Oilfield Sales-Service Network

Oklahoma
Le Roi Company Branch — Tulsa
Carson Machine & Supply Co. — Oklahoma City

East & South Texas, Gulf Coast
Southern Engine and Pump Company — Houston, Kilgore, Edinburg, Dallas, San Antonio, Corpus Christi, Texas, and Lafayette, Houma, Louisiana.

North & West Texas, New Mexico
General Machine & Supply Co. — Odessa, Snyder, Texas.
Nortex Engine & Equipment Co.—Wichita Falls, Texas.

Kansas
Carson Machine and Supply Co.—Great Bend

Illinois — Western Kentucky
Western Machinery & Engine Company — Centralia, Illinois and St. Louis, Missouri.

Michigan
Hafer Engine Service — Reed City

Rocky Mountain Area
Gehring Equipment Co. — Casper, Wyoming, Rangeley, Col.

Mississippi, Arkansas and Northern Louisiana
Ingersoll Corporation — Shreveport, Louisiana, Jackson, Mississippi, El Dorado, Arkansas

West Coast
Le Roi-Rix Machinery Co. — Los Angeles, Long Beach and Bakersfield, Calif.

Appalachian Area
P. C. McKenzie Co., Pittsburgh, Bradford.

Canada
Lucey Export Ltd. — Calgary, Edmonton, Alberta.

P-118

New BROCHURE!

Table of Contents

- Chemical and Petroleum Industry Cables
- Insulation Compounds
- Jacket Compounds
- Portable Cables
- Power Cables
- Control Cables
- Telephone Cables
- Tables

Electrical Wire and Cable for the Chemical and Petroleum Industries must have the right chemical, oil and corrosion-resistant insulations plus the right electrical and physical properties for the job. Insulations and jackets which may be excellent for one type of service may be unsatisfactory in another. United States Rubber Company, a specialist in manufacturing the *right* electrical wires and cables for the Chemical and Petroleum Industries, is the only wire and cable manufacturer growing its own natural rubber, making its own synthetic and plastic insulations.

The brochure shown above shows what "U.S." wires and cables to order for specific applications. Write to address below for your free copy.

UNITED STATES RUBBER COMPANY

U.S. RUBBER

ELECTRICAL WIRE AND CABLE DEPARTMENT • Rockefeller Center, New York 20, N. Y.

ALCO DIESEL ENGINES

. . . dependable power for your purpose

Whatever your power requirements, you can depend on Alco Diesels.

You can depend on their high operating efficiency, their low long-run cost.

For Alco Diesels are designed and built with industry's needs in mind—and with the skill gained through many years of working closely with users of diesel engines the world over.

Applications for Alco Diesels are many. They include municipal power stations, oil pipeline pumping stations, marine power, and emergency stand-by service. They include, in fact, any application calling for an economical source of dependable diesel power.

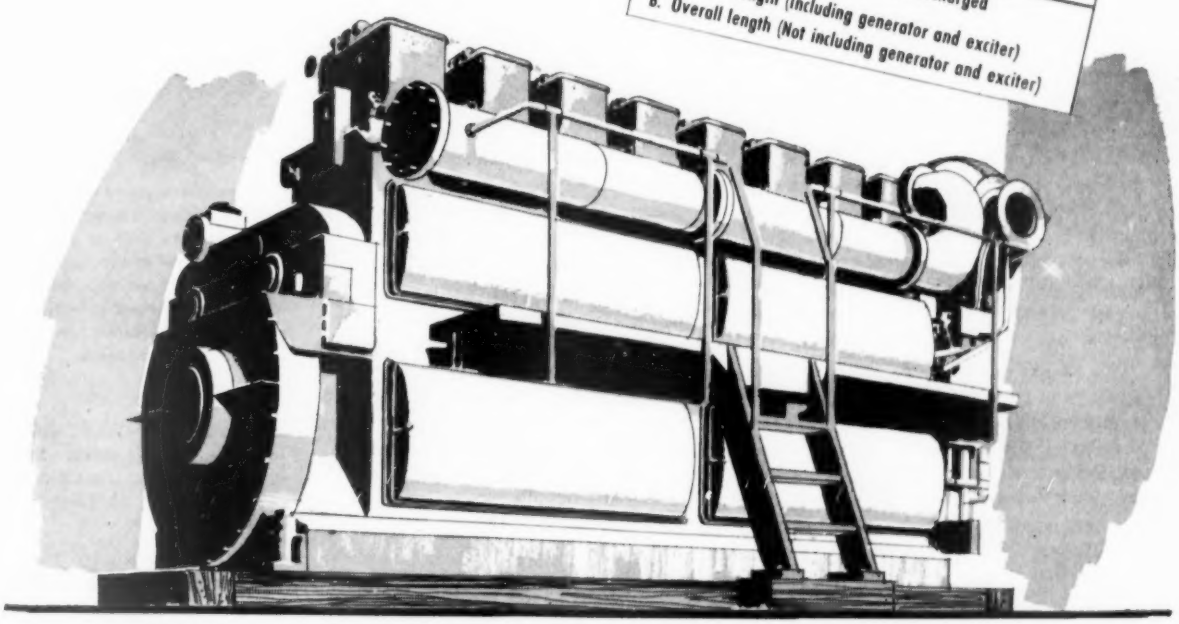
Your Alco sales representative will be happy to give you further information on Alco Diesels. You can contact him at Beaumont, Chicago, Cleveland, Houston, Kansas City, New York, San Francisco, Schenectady or St. Louis.

ALCO Engine Specifications

Type	6-12½x13		8-12½x13		*6-12½x13-T		*8-12½x13-T	
RPM	600	720	600	720	600	720	600	720
BHP	540	650	720	865	810	975	1080	1300
Bore	12½"		12½"		12½"		12½"	
Stroke	13"		13"		13"		13"	
A	20'-6½"		24'-9¼"		23'-6"		26'-8½"	
B	12'-11¾"		16'-8¼"		13'-4"		17'-3"	
Height	5'-0"		6'-8½"		5'-10½"		6'-1½"	
Width	20½"		21¼"		19½"		21"	

*Turbocharged

A. Overall length (Including generator and exciter)
B. Overall length (Not including generator and exciter)



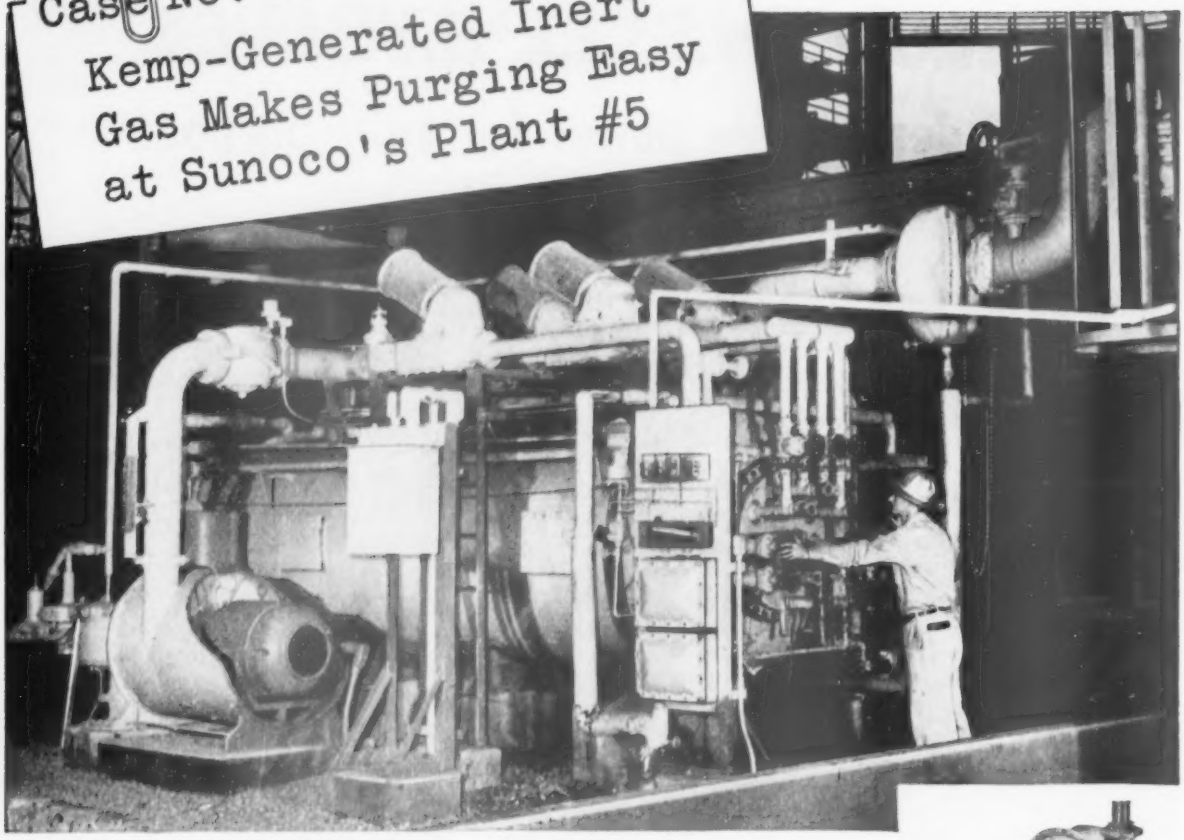
ALCO DIESELS

AMERICAN LOCOMOTIVE COMPANY
SCHENECTADY, N. Y.

THE MARK OF MODERN ENGINEERING

Case No. 57

Kemp-Generated Inert Gas Makes Purging Easy at Sunoco's Plant #5



How Sun Oil's "Magic Mill" at Toledo operates with 'round the clock safety

There's no *one* word that strikes terror in the hearts of oilmen everywhere more quickly than F-I-R-E! To combat this threat at the Sun Oil Co.'s giant refinery at Toledo, Ohio, constant vigilance, checks and inspections are the answer. And the liberal use of inert gas for purging pipelines, tanks and crackers is essential to this safety maintenance.

Kemp selected to do the job

When plans called for *doubling* plant production in 1950, a new Kemp Generator (see above) was installed to insure adequate inert gas production. Fast-starting, easy-to-operate, this Kemp unit more than filled the bill. Today tanks and lines are periodically purged for inspection and cleaning *as often as needed*. And thanks to its 60,000 cu. ft. per hr. Kemp Inert Gas Generator, Sunoco enjoys *exact analysis* inert production that meets all its purging requirements.

Let Kemp help you, too

If you have a purging or blanketing problem, why not let Kemp Engineers give you the same helpful advice used so profitably at Sun Oil's Toledo refinery. It costs you nothing to investigate. And it may save you money. Find out how Kemp's wide range of dependable, low-cost Generators (complete with the latest fire checks and safety devices) offer you the best way to solve your problems.

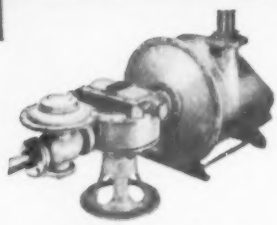
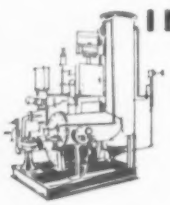


Photo above shows close-up view of Kemp Industrial Carburetor, the heart of every Kemp installation. Assures complete combustion... without waste, without tinkering. Reduces installation costs, simplifies maintenance.

For more complete facts and technical information, write for Bulletin I-10 to: **C. M. KEMP MFG. CO., 405 E. Oliver Street, Baltimore 2, Maryland.**

KEMP OF BALTIMORE



INERT GAS GENERATORS

CARBURETORS • BURNERS • FIRE CHECKS
METAL MELTING UNITS • ADSORPTIVE DRYERS • SINGEING EQUIPMENT

Sometimes we land a big one!

We keep fishing for new ways to tell the oil industry's story. And every so often we reel in something big and dramatic.

For example, not long ago an oil marketer in Michigan noticed that the price he paid for gasoline was just about the same as it had been in the middle twenties. So he wrote and asked us how these two gasolines compared in *value*.

We thought this had the makings of a real story. So we went to work to dig out the facts. We studied the road performance of these gasolines in contemporary cars of the various years. We also made a study of the average retail price of the two gasolines and found that the price, exclusive of taxes, was about the same.

In the end, all the evidence pointed to one conclusion: by any realistic stand-

(*Continued on next page*)

ETHYL

Printed in U. S. A.

Sometimes we land a big one!

(Continued from preceding page)

ard, the *value* of gasoline had increased approximately 50% in the last quarter century. In other words, *two gallons of today's gasoline will do the work of 3 gallons of 1925 fuel.* And we demonstrated this to the petroleum industry and the public.

It was news! Newspapers across the country picked it up. Magazines ran feature articles about it. It blossomed out on billboards. It became the theme of Oil Progress Week, and a fact familiar to motorists all over America.

Yet, this kind of public relations job is never finished. Even today too few people realize what a tremendous job the petroleum industry is doing to improve America's standard of living.

We believe that as a part of the oil industry we should aid in every way we can to tell this impressive story over and over again.

ETHYL CORPORATION

NEW YORK 17, NEW YORK

Ethyl service is backed by 30 years of antiknock experience

RESEARCH

SUPPLY SERVICE

TECHNICAL REPORTS

SALES HELPS

ROAD TESTING

GASOLINE TESTING

PIPE LINE PROGRESS

A. O. Smith Line Pipe being lowered in for a Southern Natural Gas Company Transmission Line.

Southern Natural Gas Company's new lines to tap south Louisiana gas fields

By year's end, Southern Natural Gas Company will have lowered in 311 new miles of 24-inch, 20-inch and 16-inch mains to bring Duck Lake, Main Pass and intermediate production to Gwinville, Mississippi. Here, south Louisiana gas will enter the company's east-west system for distribution to Mississippi, Alabama and Georgia consumers.

This new mileage, except for some field and gathering lines, will all be A. O. Smith line pipe, 68 miles of 24-inch from Gwinville to Franklinton, La., 220 miles of 20-inch comprising the legs to Duck Lake to the southwest and Olga to the southeast. 23 miles of 16-inch extend the Olga leg to Main Pass in the Gulf.

FIRSTS by A. O. Smith: Welded line pipe • Internally expanded pipe • Light-wall large-diameter pipe • World's largest producer of large-diameter welded steel pipe.

Unusual pipelining practices will be employed near the gulf, where much of the land is under water or close to it. Here the pipe will be lowered into canals. Concrete jacketing will be applied as a protective "ballast."

At completion, Southern Natural Gas Company's transmission system will contain more than 1,000 miles of A. O. Smith line pipe, including earlier shipments. Current requirements are being shipped from our Houston and Milwaukee mills in close harmony with the construction schedules.

A. O. Smith Line Pipe is available in a complete range of sizes and wall thicknesses, from 8⅝ in. to 36 in. diameters.

The A. O. Smith Casing Mill is operating at capacity to supply vitally needed casing for the Oil and Gas Industry.

A. O. Smith

CORPORATION

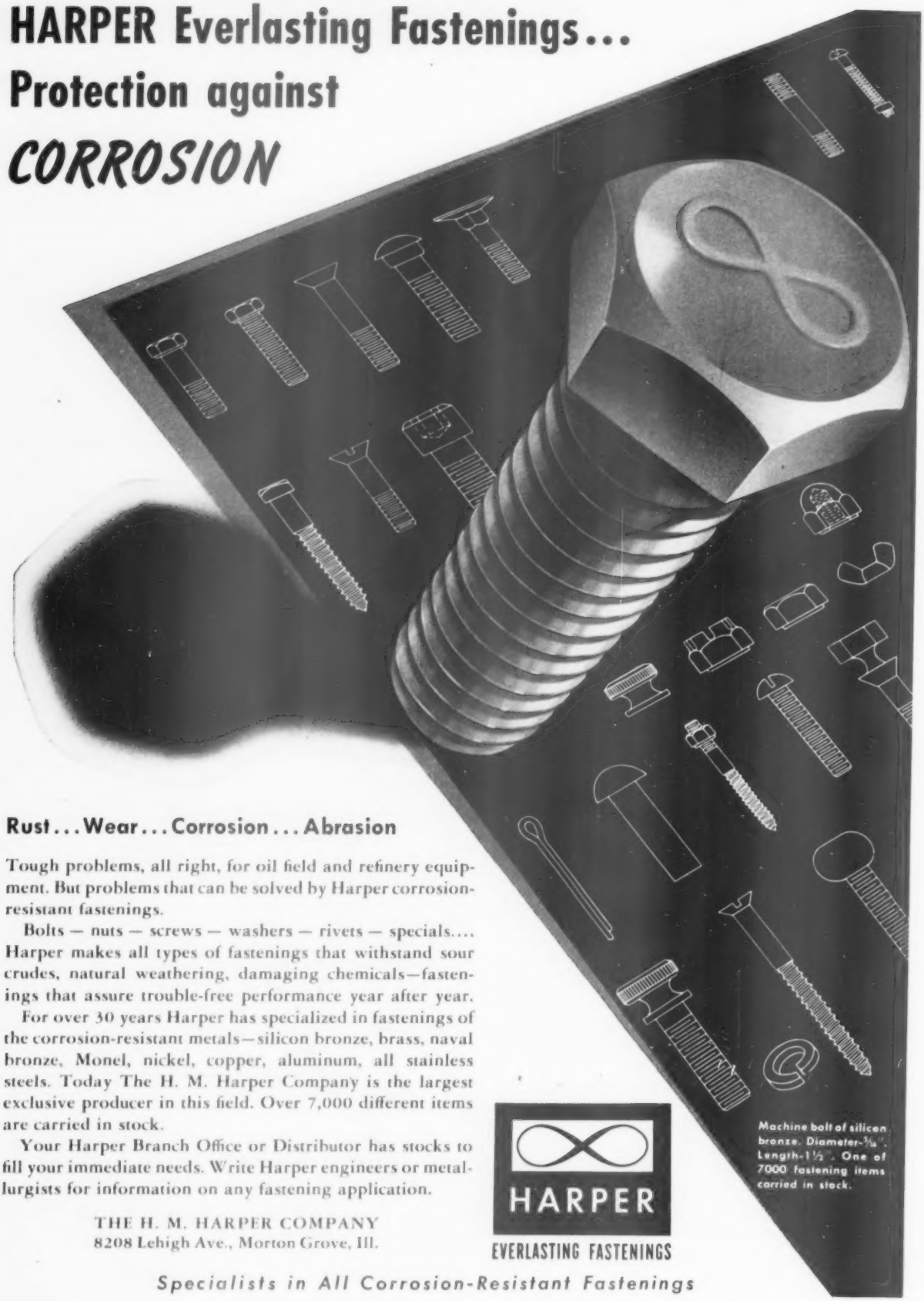
LINE PIPE • CASING

Chicago 4 • Dallas 2 • Denver 2 • Houston 2
Los Angeles 22 • Midland 5, Texas • New Orleans 12
New York 17 • Pittsburgh 19 • San Francisco 4
Seattle 1 • Tulsa 3 • Washington 6, D.C.

International Division: Milwaukee 1

DEPENDABILITY THROUGH RESEARCH AND ENGINEERING

HARPER Everlasting Fastenings...
Protection against
CORROSION



Rust... Wear... Corrosion... Abrasion

Tough problems, all right, for oil field and refinery equipment. But problems that can be solved by Harper corrosion-resistant fastenings.

Bolts — nuts — screws — washers — rivets — specials.... Harper makes all types of fastenings that withstand sour crudes, natural weathering, damaging chemicals—fastenings that assure trouble-free performance year after year.

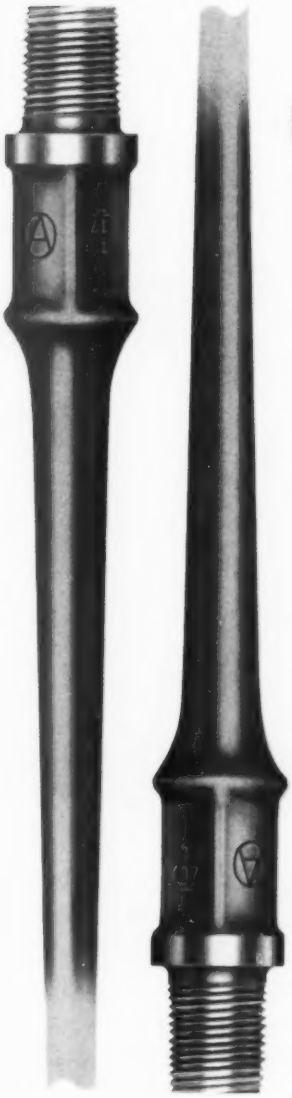
For over 30 years Harper has specialized in fastenings of the corrosion-resistant metals—silicon bronze, brass, naval bronze, Monel, nickel, copper, aluminum, all stainless steels. Today The H. M. Harper Company is the largest exclusive producer in this field. Over 7,000 different items are carried in stock.

Your Harper Branch Office or Distributor has stocks to fill your immediate needs. Write Harper engineers or metallurgists for information on any fastening application.

THE H. M. HARPER COMPANY
8208 Lehigh Ave., Morton Grove, Ill.

HARPER
EVERLASTING FASTENINGS

Specialists in All Corrosion-Resistant Fastenings



THERE'S A LOT OF DIFFERENCE IN SUCKER RODS!

You know where to get a thick, juicy, tender steak, cut from U. S. prime and cooked to a king's taste. You like to recommend the place, because a good steak is always welcome.

Our insistence about Axelson Sucker Rods stems from the same good-fellowship. There's a lot of difference in rods.

INTERESTING POINTS ABOUT AXELSON

Axelson has made and *improved* pumping equipment for 61 years. Axelson rods are more than just threaded bar stock.

Our own men have observed sucker rod performance for forty-eight years. They understand Axelson superiority, what type to recommend, the correct size or combination of sizes. These things are important.

There is no economical substitute for quality—and NO substitute for experience.

AXELSON.... *Chosen first . . . to last!*

JONES & LAUGHLIN STEEL CORPORATION
SUPPLY DIVISION

J&L STEEL

General Offices: TULSA, OKLAHOMA
88 STORES • 19 OFFICES • 9 RESIDENT SALESMEN
EXPORT: 405 Lexington Ave., New York, N. Y., U. S. A.

HOW'S THIS FOR OS&D HOSE PERFORMANCE?

Tanker loading conditions are particularly severe at the Union Oil Company's Port San Luis Wharf, Avila, California. When heavy seas are running, tankers must be held some 75' to 100' away from the dock with the aid of four heavy mooring buoys plus the ship's anchor. In spite of these conditions, Hewitt-Robins Smooth Bore Oil Suction & Discharge Hose performs with maximum efficiency.

Normal life expectancy for loading hose at this installation is 15,000,000 barrels, yet a single line of Hewitt-Robins Smooth Bore OS&D Hose has handled over 37,000,000 barrels to date. Here again, a customer's performance record has shown that for longer hose life and more economy in operation the first and best choice is Hewitt-Robins Hose.

For immediate information regarding Hewitt-Robins OS&D Hose or any *Hewitt-Robins industrial hose contact your local Hewitt Rubber Distributor (See "Rubber Products" Classified Phone Book.)*

HEWITT HR ROBINS

Executive Offices, Stamford, Connecticut

DOMESTIC DIVISIONS: Hewitt Rubber • Robins Conveyors • Robins Engineers • Restfoam
FOREIGN SUBSIDIARIES: Hewitt-Robins (Canada) Ltd., Montreal • Hewitt-Robins Internationale, Paris, France • Robins Conveyors (S. A.) Ltd., Johannesburg • EXPORT DEPARTMENT: New York City.

FWD heavy-duty trucks . . .

This FWD 6 x 6 Model MU, with integral derrick, lifts pipe out for cleaning and servicing, lowers it back when job is done.

Here is an FWD U series tractor loading drilling mud mixed with crude oil for access road surfacing. It also hauls heavy pipe and drilling equipment.

In the Michigan fields, this FWD is used to move six drilling rigs from well to well.

This FWD 6 x 6 provides high speed transport for heavy equipment and machinery despite frequent poor footing.

speed work, handle more assignments, and reduce service costs

Whether you're about to replace some of your older trucks or looking for a rugged trouble-shooter, an FWD is the answer. That's because FWDs for oilfields, pipelining and exploration give you all the advantages of true four-wheel-drive traction PLUS low maintenance.

Designed with the help of veteran oil men FWDs have *"built-in"* features that oilmen want. As a result, FWDs haul bigger loads, get through where other rigs fail, work more days per year, yet cut your service and maintenance bills.

To get the details, see your FWD dealer. He'll be pleased to help you select the FWD 4 x 4 or 6 x 6 model or models that meet your exact needs.

THE FOUR WHEEL DRIVE AUTO CO.
Clintonville, Wis. *Canadian Factory*: Kitchener, Ontario

An FWD 6 x 6 starts to lift pipe out of a well in the West Edmund field north of Oklahoma City. It has a portable derrick for servicing wells without a permanent derrick.

Built by the makers of America's Foremost Heavy-Duty Trucks

Here is a magneto that controls explosive fumes with "flame-proof" ventilation. The special ventilating arrangement of the Bendix Low-Tension Magneto permits air laden with explosive fumes to enter the magneto for ventilation without danger of igniting the surrounding air. Kits are also available to convert magnetos now in use to the "flame-proof" ventilation type.

In addition to this important safety feature Bendix Low-Tension Magnetos actually reduce engine maintenance and operating costs. For example, spark plug erosion is reduced to a minimum. The distribution of low tension voltage to the high tension coils is through a series of breaker assemblies, thus eliminating trouble often experienced with the conventional distributor. Variable or fixed sparks can be obtained by internal adjustment.

For safety and low operating costs it will pay you to specify Bendix Low-Tension for all your magneto requirements. Complete data available on request.

- Low Plug Erosion Rate
- Breaker Type Distributor
- Ventilation without Fire Hazard
- Radio Shielding Available
- Variable or Fixed Ignition

Bendix

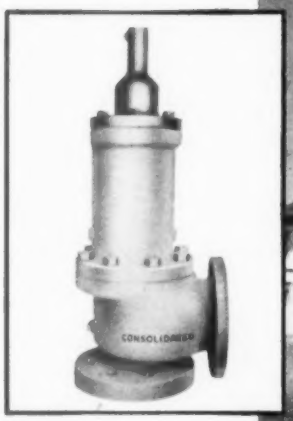
SCINTILLA MAGNETO DIVISION OF
SIDNEY, NEW YORK

Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, New York

Bendix
AVIATION CORPORATION

FACTORY BRANCH OFFICES:
117 E. Providencia Avenue, Burbank, California • Stephenson Building, 6560 Cass Avenue, Detroit 2, Michigan
Brouwer Building, 176 W. Wisconsin Avenue, Milwaukee, Wisconsin • 582 Market Street, San Francisco 4, California

ALWAYS ALERT TO DANGER . . .



CONSOLIDATED SAFETY RELIEF VALVES

The hazards of uncontrolled overpressures are easy to avoid. Consolidated Safety Relief Valves assure *absolute protection* for personnel, plant and processing equipment. They don't leak under discharge piping stresses because their design incorporates outside bevel seat and floating guide construction. The disc seats on a radial seating surface — dependable tightness is assured in all positions within the deflection range. Unfired pressure vessels — gas, vapor, and liquid storage tanks, pipelines, pumps — are dependably safeguarded against overpressures, even in the severest services.

Consolidated Safety Relief Valves have 25% fewer parts than ordinary valves of their type. Naturally, maintenance problems are greatly reduced and service life is increased, while standardization is simplified. Materials of the highest quality, precision workmanship and rigid tests assure continuously reliable performance at the rated capacity. Full information is yours on request.

YOUR INDUSTRIAL SUPPLY DISTRIBUTOR has all kinds of experience in meeting the most exacting requirements of the processing industries. You can count on his ability, knowledge and facilities for the best in products and service. Phone or write him today.

CONSOLIDATED SAFETY RELIEF VALVES

A product of **MANNING, MAXWELL & MOORE, INC.** TULSA, OKLAHOMA

MAKERS OF 'CONSOLIDATED' SAFETY AND RELIEF VALVES, 'AMERICAN' INDUSTRIAL INSTRUMENTS, 'ASHCROFT' GAUGES, 'HANCOCK' VALVES, AIRCRAFT PRODUCTS. BUILDERS OF "SHAW-BOX" AND 'LOAD LIFTER' CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES.

Another reason why

Chase

Antimonial Admiralty Tubes last longer!*

(a patented alloy)

Yes, you can *count* on Chase Antimonial Admiralty Heat Exchanger Tubes to give you many years of satisfactory service.

Chase Heat Exchanger Tubes are rigidly controlled for quality during manufacture, and various tests are applied when the tube is finished. The flattening test mentioned below is a good example. Wall thickness, diameter, surface finish, concentricity and accuracy of length are carefully determined.

So, for Heat Exchanger tubes that last and last, *remember:* insist on Chase Antimonial Admiralty!

*U.S. Pat. No. 2,061,921

PUTTING THE SQUEEZE ON IMPERFECTIONS...

This Chase technician is performing a "flattening test" which is an indication of soundness and freedom from hidden defects. You are assured that tubes passing this test will satisfactorily withstand bending or end flaring.

Chase BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

CHASE WAREHOUSE STOCKS:
NEW YORK, BALTIMORE,
NEW ORLEANS, LOS ANGELES

Also carried by
Vinson Supply Co., Tulsa,
Standard Brass & Mfg. Co., Houston.

• *The Nation's Headquarters for Brass & Copper* Albany† Atlanta Baltimore Boston Chicago Cincinnati Cleveland Dallas Denver Detroit Houston Indianapolis Kansas City, Mo. Los Angeles Milwaukee Minneapolis Newark New Orleans New York Philadelphia Pittsburgh Providence Rochester† St. Louis San Francisco Seattle Waterbury †sales office only

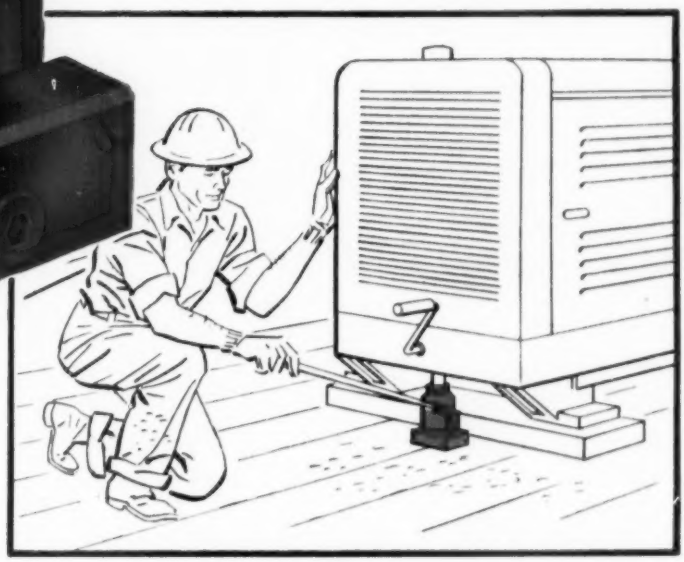
This modern jack can lift heavier loads with less effort!

This precision built jack requires much less effort to operate than mechanical type jacks because it utilizes the hydraulic principle—a pump does the work.

Duff-Norton Hy-Power Hydraulic Jacks, because of this ease of operation, are finding more widespread use in the oil fields for all kinds of heavy lifting and pushing jobs. They are standard equipment on many rig builders' trucks and on drilling rigs.

The hydraulic jack illustrated (No. 25H9) can lift 25 tons up to 6 inches. It is only 9⅜ inches high when closed and weighs only 38 lbs. There are nine other models of Duff-Norton Hydraulic Jacks with capacities from 3 to 50 tons. All models can be equipped with gauges calibrated to show exact weight of load being lifted.

See these time and energy saving hydraulic jacks at your favorite supply store or write the world's oldest and largest manufacturer of lifting jacks for complete specifications. Ask for Hy-Power Hydraulic Jack Bulletin AD16-B, The Duff-Norton Manufacturing Co., P.O. Box 1889, Pittsburgh 30, Pa. Canadian plant —Toronto 6, Ontario.

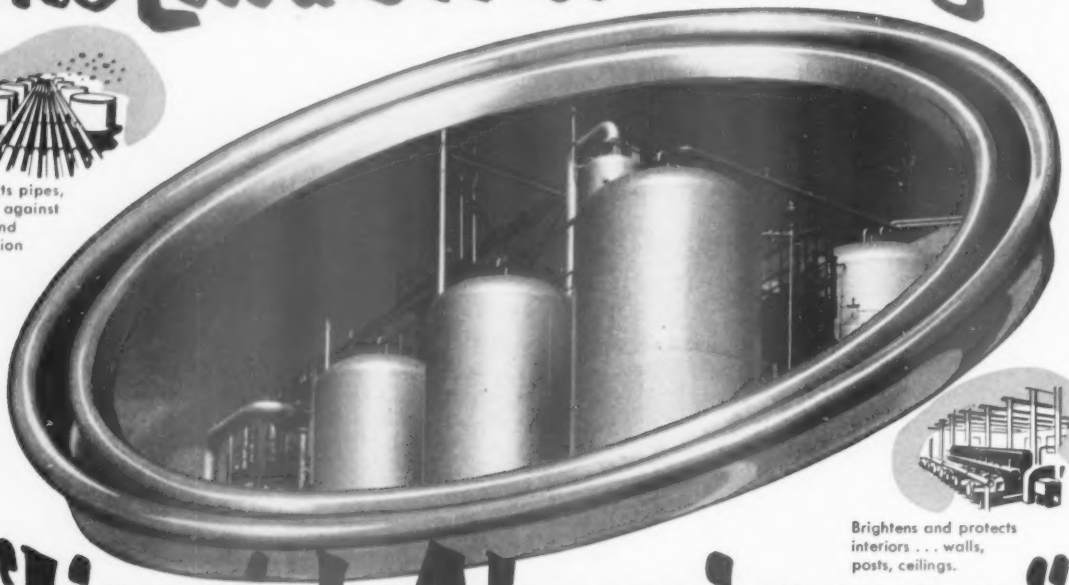


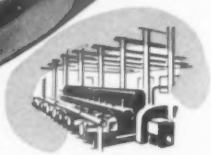
DUFF-NORTON *Jacks*

"Giving Industry A Lift Since 1883"

The Lid's Off to Savings-

Protects pipes, tanks, against rust and corrosion





Brightens and protects interiors . . . walls, posts, ceilings.

"Liquid Aluminum" is Here!

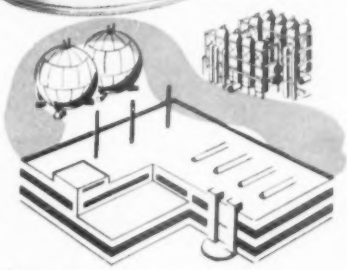
Improves appearance . . . minimizes expansion and evaporation problems

It's the petroleum industry's most protective and most beautiful coating inside or outside! Sparkling *Liquid Aluminum* is amazingly resistant to money-eating rust . . . resists corrosion from smoke and fumes, too. It reflects up to 85% of heat and light rays . . . reduces evaporation losses . . . minimizes expansion and contraction problems . . . makes plant interiors brighter.

Look for the Liquid Aluminum label on the aluminum paint you choose. It is made to approved minimum standards by leading paint manufacturers. Ask your paint supplier or write for names of manufacturers to Reynolds Metals Company, 2595 So. Third St., Louisville 1, Ky.

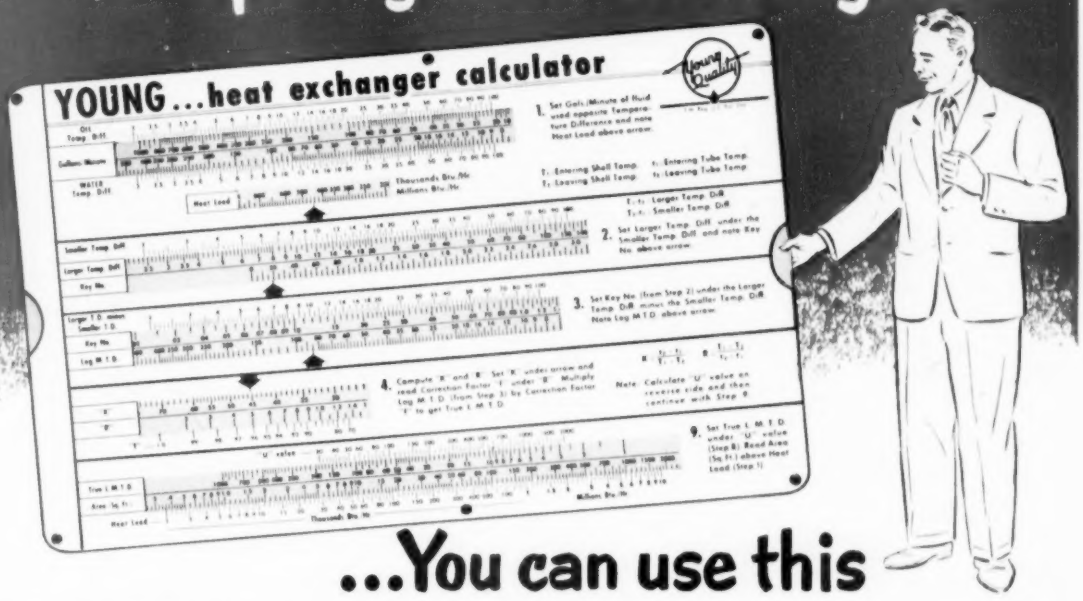
. . . And for economical, lasting, one-coat protection for your built-up or rustable metal roofs

. . . look for this warranty and this label when you buy asphalt-aluminum roof paint or coating! *Liquid Aluminum* Roof Paint or Coating adds years to roof life—also keeps buildings cooler in summer; cuts air conditioning costs; increases employee efficiency and morale. The *Liquid Aluminum* label and the special Warranty Seal are your assurance of quality roof protection. Write for folder with detailed information.



This advertisement appears in the interest of the Paint Industry of America.

If You Specify Heat Exchangers...



...You can use this

NEW YOUNG HEAT EXCHANGER CALCULATOR

AN EASY WAY TO SELECT THE CORRECT UNIT FOR YOUR JOB
Single pass, fixed tube bundle, 74 stock models
Two and four pass, fixed tube bundle, 100 stock models
Single pass, removable tube bundle, 258 models
2-pass removable tube bundle, 258 models
YOUNG

This exclusive Young Heat Exchanger Calculator is an engineering tool specially designed to help you calculate and specify Young shell and tube Heat Exchangers. Designed to save you time, the Calculator enables an engineer to determine quickly individual heat transfer coefficients for the shell side and tube side, and by combining them with suitable fouling factors to determine over-all heat transfer coefficients. It also gives you a visual picture how the size of a Heat Exchanger will vary with fluid temperatures and velocities.

YOUNG RADIATOR COMPANY

Heating, Cooling, Air Conditioning Products for Home and Industry
Heat Transfer Products for Automotive, Industrial, Gas or Diesel Engine Applications

Dept. 203-F. • Racine, Wisconsin • Factories at Racine, Wisconsin and Mattoon, Illinois

Get Your Young Heat Exchanger Calculator from Your Nearest Young Representative

ALABAMA
Charles F. Wheelock & Assoc.
P.O. Box 1290, 205 South 32nd St.
Birmingham, Ala.

ARIZONA
Central Station Equip. Co.
2323 Aviation Highway
Tuscon, Ariz.

CALIFORNIA
Haskel Engineering & Supply Co.
721 W. Broadway, Glendale, Calif.

Transmission Engineering Co.
53 Stevenson St., San Francisco, Calif.

COLORADO
Alta Engineering Co.
11650 Montview Blvd.
Aurora, Colo.

ILLINOIS
Norman Engineering Co.
2115 West Marquette Rd.
Chicago, Ill.

MASSACHUSETTS
Pump Equip. & Engineering Co.
79 Prospect St., Somerville, Mass.

MARYLAND
Cauliflower, Inc., Ellicott City, Md.

MICHIGAN
Industrial Air & Hydraulic Equip. Co.
13306 Kercheval Ave., Detroit, Mich.

Harold J. Young
206 Montgomery Bldg.
920 Second St., Muskegon, Mich.

MISSOURI
Allied Transmission Equip. Co.
1733 Main St., Kansas City, Mo.

Ar-Ka Engineering Inc.
1319 South Vandeventer Ave.
St. Louis, Mo.

NEBRASKA
Schneider Elec. & Equip. Co.
1108 Farnam St., Omaha, Neb.

NEW JERSEY
Edwin J. Montalvo Co.
241 Main St., Rm. 304
Hackensack, N. J.

Ameresco, Inc. (Export)
33 Watchung Plaza, Montclair, N. J.

NEW YORK
Wrightson & Campion
55 W. 42nd St., Rm. 1508A
New York, N. Y.

Keller Industrial Products
217 East Ave., Rochester, N. Y.

NORTH CAROLINA
Charles M. Swart
P.O. Box 1261, Greensboro, N. C.

OHIO
Wikel & Cornelious, Inc.
702-703 Mercantile Library Bldg.
Cincinnati, O.

Paquin Co.
13405 St. Clair Ave., Cleveland, O.

OKLAHOMA
Nix Industrial Supply Co.
2702 South High St.
Oklahoma City, Okla.

OREGON
Hydraulic Power & Equip. Co.
2316 N. W. Savier St., Portland, Ore.

PENNSYLVANIA
Device Engineering
1701 Walnut St.
Philadelphia, Penn.

SOUTH CAROLINA
Livingston & Haven, Inc.
P. O. Box 808
2115 Meeting St. Rd.
Charleston, S. C.

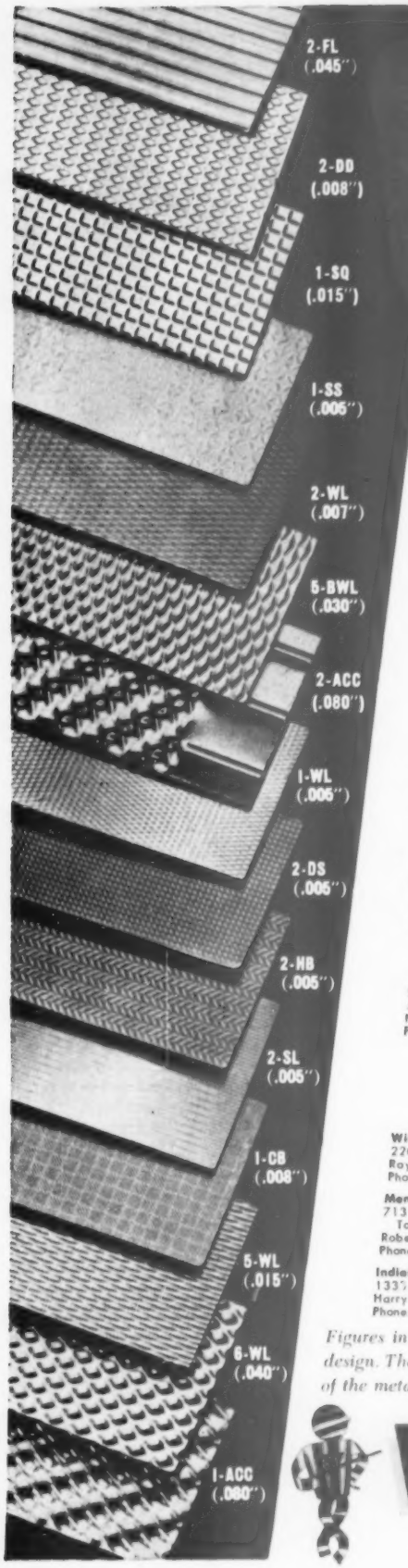
TENNESSEE
Southern Company, Inc.
300 East Georgia Ave.
Memphis, Tenn.

TEXAS
C. G. Wilson Co.
1501 South Akard St., Dallas, Tex.

Hydraquip Corp.
6645 Navigation Blvd.
Houston, Tex.

UTAH
Robert Taylor & Sons
P. O. Box 1223, 1077 Main St.
Salt Lake City, Utah

WASHINGTON
John F. Gertz Co.
3242 Eastlake Ave., Seattle, Wash.



RIGID-TEX METAL?

Here is a third-dimensional metal that is going places—*many* places.

If you have an application where appearance is an important factor—or where greater strength at a lighter weight is desired, then you may find Rigid-Tex has a place in your plans, too.

Rigid-Tex utilizes a process for redistributing a smooth metal surface into three-dimensional patterns. The result is a rigid texture which:

1. Conceals scratches, finger prints, scuff marks, and smudges—assuring you an attractive metal surface that retains its appearance long after ordinary metal surfaces have become dingy and marred.
2. Usually reduces metal thicknesses by two full gauges—saving 50% or more of the metal by providing more square or lineal feet per pound.

Rigid-Tex has a non-skid surface, and possesses excellent heat transfer properties. It is ideal for accoustical applications . . . is easy to fabricate and can be bent, soldered, welded, riveted, formed, stamped, drawn, and lock-seamed.

Large sheets can be efficiently and easily handled without the hazards of bulging or distortions.

You will find it profitable to look into the possibilities of Rigid-Tex in your own applications. We'll send literature and samples. No obligation.

Call, wire, or write nearest Metal Goods Corporation Representative:

OFFICES AND WAREHOUSES

St. Louis 15, Missouri
5239 Brown Avenue
Nelson L. Hower
Phone: GOodfellow 1234

Tulsa 3, Oklahoma
302 North Boston
Scott J. Harrison
Phone: 4-4101

Kansas City 16, Mo.
1300 Burlington
Frank D. Hogan
Phone: NOrclay 3516

Denver 2, Colorado
2425 Walnut Street
Neal Dehn
Phone: AComa 5891

Dallas 9, Texas
6211 Cedar Springs Rd.
Sam D. Hodgdon
Phone: ELmhurst 3271

Houston 3, Texas
711 Milby Street
Harris T. Gregg
Phone: CEntral 8881

New Orleans 12, La.
432 Julia Street
Carl T. Wedemeyer
Phone: CAnal 7373

SALES SERVICE OFFICES

Wichita, Kansas
2200 East Central
Ray Noller
Phone: 7-8921

Jackson, Mississippi
781 Raymond Road
George E. Akerberg
Phone: 5-2711

Baton Rouge, Louisiana
4419 Mimosa Street
Paul P. Vidovic
Phone: 4-4738

Omaha, Nebraska
3515 No. 67th Avenue
C. M. Cooley
Phone: WAlnut 1112

Memphis, Tennessee
713 Columbian Mutual Tower Bldg.
Robert W. Downs
Phone: 5-8721

San Antonio, Texas
2012 Alamo Natl. Bldg.
Robert E. Reese
Phone: GArfield 3161

Davenport, Iowa
924 State Street
Robert L. Tharp
Phone: 2-3156

Decatur, Illinois
1305 West Sunset
Arlie W. Tempel
Phone: 8-1314

Indianapolis 2, Ind.
1335 N. Pennsylvania
Harry L. Newton
Phone: Lincoln 4980

Beaumont, Texas
238 Bowie Bldg.
Lee T. Dodson
Phone: 4-7536, 4-7537

Fort Worth, Texas
3821 Carolyn
John M. Turbitt
Phone: FOrtune 4369

Corpus Christi, Texas
Room 301-02 Wilson Bldg.
Roy D. Bagaley
Phone: 4-0366

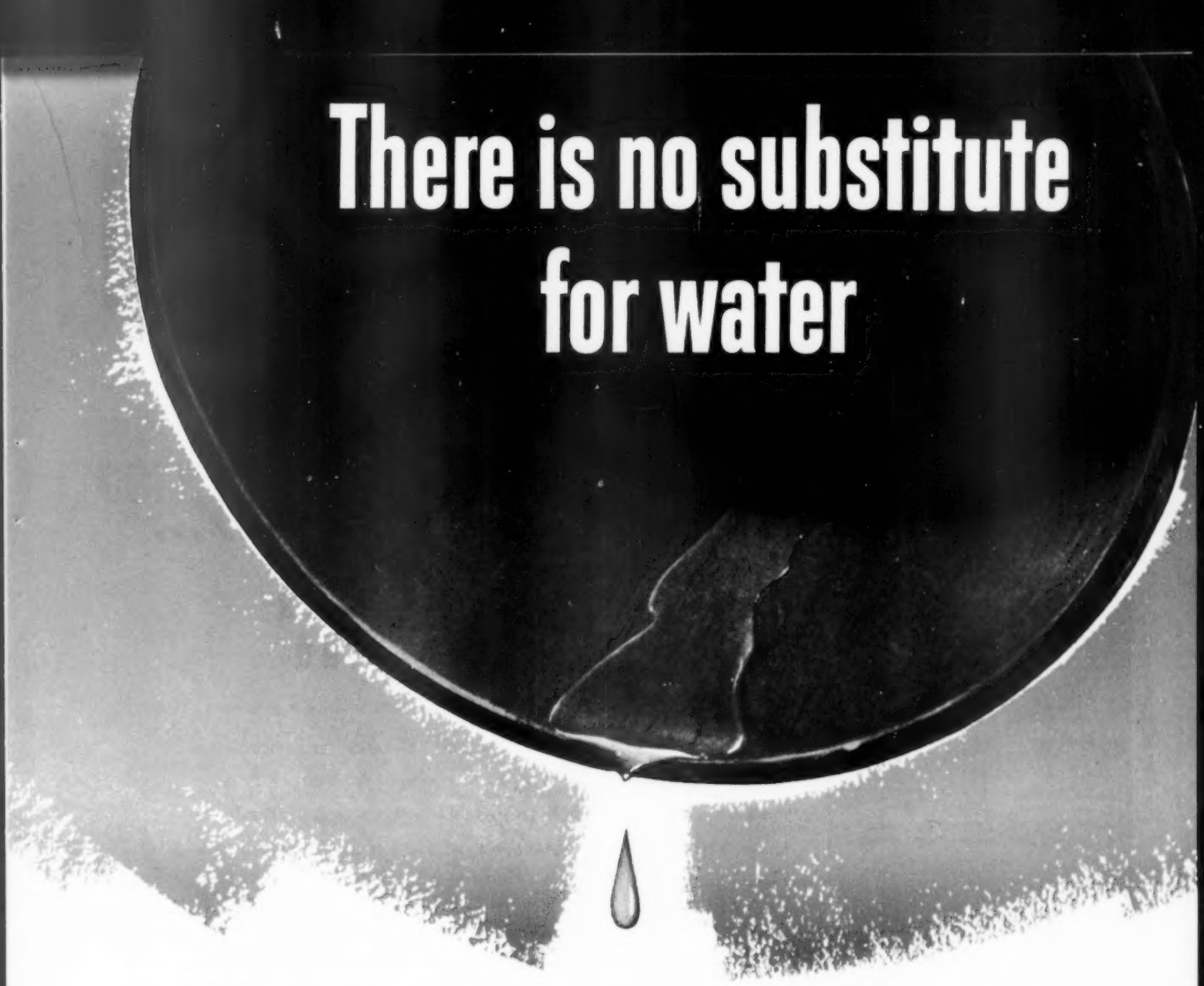
Figures in parentheses, under pattern numbers, indicate approximate maximum depth of each design. These figures, added to the original thickness of the plain metal, give the overall thickness *of the metal after rigidizing.*

METAL GOODS CORPORATION

Distributors for RIGID-TEX METAL

GENERAL OFFICES: ST. LOUIS 15, MISSOURI

There is no substitute for water



. . . and there is no substitute for experienced engineering in developing a dependable water system

Nothing has ever taken the place of water among the basic needs of man. And nothing will ever take the place of safe, sure, *experienced* engineering in developing a dependable water supply.

Layne's reputation as the world's most experienced developer of well water systems was earned by engineering skill every step of the way—from on-the-spot geological surveys to the precision designing of each pump for its particular job. For the best in well water systems, there is no substitute for Layne engineering.

Let Layne engineers help you PLAN AHEAD on your water needs

Layne welcomes the opportunity to share in long-range planning for water-system needs. Contact your nearest Layne Associate Company or write Layne & Bowler, Inc., General Offices, Memphis 8, Tenn.

WATER WELLS

VERTICAL TURBINE PUMPS

Layne Associate Companies Throughout the World

HOUSES BUILT AT A FACTORY...

YOUR *BEST* BET FOR OIL FIELD HOUSING . . .

STURDYBILT Prefabricated Houses are precision built *at the factory.* Top grade, seasoned lumber is used exclusively; and each prefabrication section is made to fit with every other section.

You can choose from many standard designs that will fit every housing need, large or small. Whether you need one small lease house or an entire oil field camp, one purchase order takes care of plans, construction, transportation and erection. What's more your factory-built STURDYBILT houses can easily be moved from one site to another with little or no loss of material.

■ WRITE FOR INFORMATION

● MANUFACTURERS OF SPECIAL MILLWORK: DISTRIBUTORS OF JOHNS-MANVILLE BUILDING MATERIALS; CURTIS WOODWORK

STURDYBILT PREFABRICATED, DEMOUNTABLE HOUSES

SOUTHERN MILL & MANUFACTURING CO. ● TULSA, OKLAHOMA

STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

Where corrosion resistance is vital

Several years ago, it looked as if a 4200-ft. sour crude well in West Texas would have to be abandoned. The reason: the high sulfur crude was corroding out the pumps too fast. Finally, to hold the lease, the operators decided to try a pump made of Monel®. Using a Harbison-Fischer pump, the well was successfully operated for 18 months. At the end of that time, the well was practically exhausted and no longer economical to operate. But not the pump — when it was removed, threads and working parts were found to be in excellent shape!

Given a new barrel, the pump was installed in another corrosive well, in Arkansas. At last report, it had given one year of additional service. Many similar Harbison-Fischer pumps of Monel construction have served in corrosive wells for four years or longer.

This is only one example of how Monel and the other Inco Nickel Alloys are used to solve tough oil field equipment problems. If your problem involves corrosion by sour crude, brine or acids — or heavy wear, or the physical punishment that most oil field equipment is subject to, it will pay to look into the possibilities of the Inco Nickel Alloys.

At present, it is advisable to place equipment orders with your supplier well in advance of scheduled use. Distributors of Inco Nickel Alloys can supply the latest information on availability from warehouse and mill.

The International Nickel Company, Inc.
67 Wall Street, New York 5, N. Y.

7 vital pump parts are made of Monel

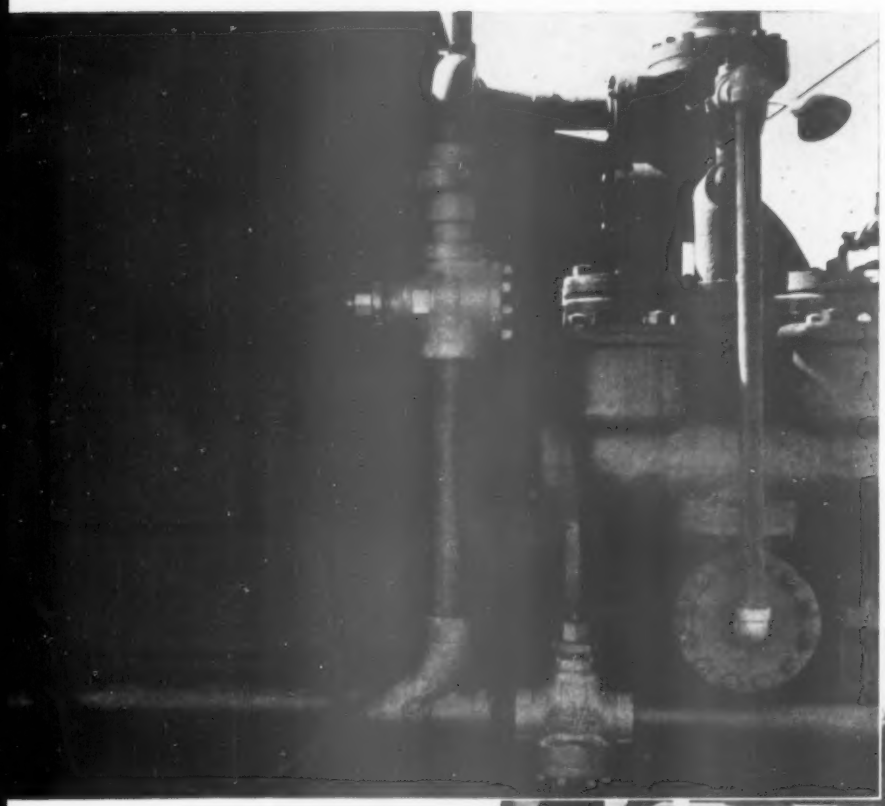
The special feature of the Harbison-Fischer "Flexite" Rod Pump is the Flexite rings. Precision-ground to fit the barrel tube exactly, the rings are made of a special hard plastic composition impregnated with graphite. According to the manufacturer, they do not require soaking or prefitting, and will not corrode or disintegrate. They make worthy companions to the corrosion-resisting Monel used for other component parts, such as: cages (1), balls and seats (2), barrel (3), seat frame (4), plunger locknut (5), plunger tube (6), and spacer rings (7). For further information, write to Harbison-Fischer Manufacturing Company, Box 64, Fort Worth, Texas.

Inco Nickel Alloys

INCO TRADE MARK

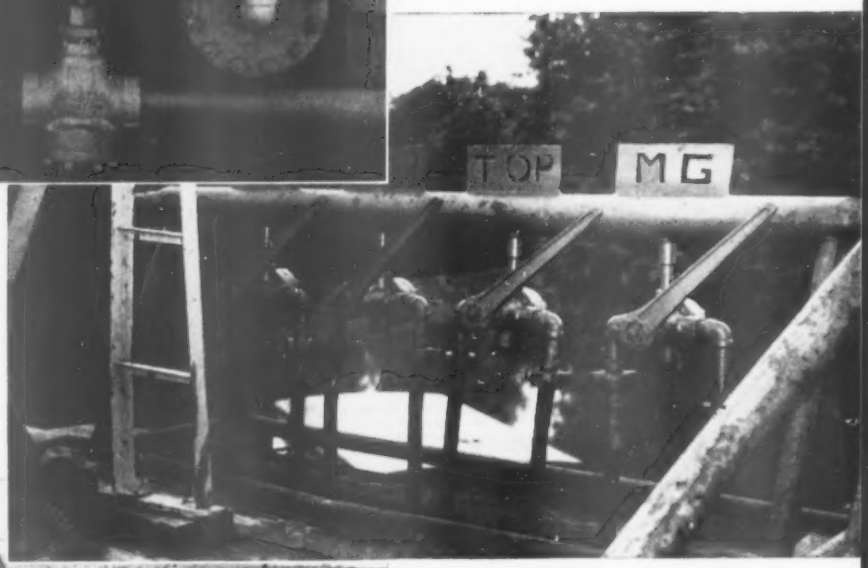
Monel . . . *YOUR PARTNER IN PROGRESS*

3 REASONS WHY



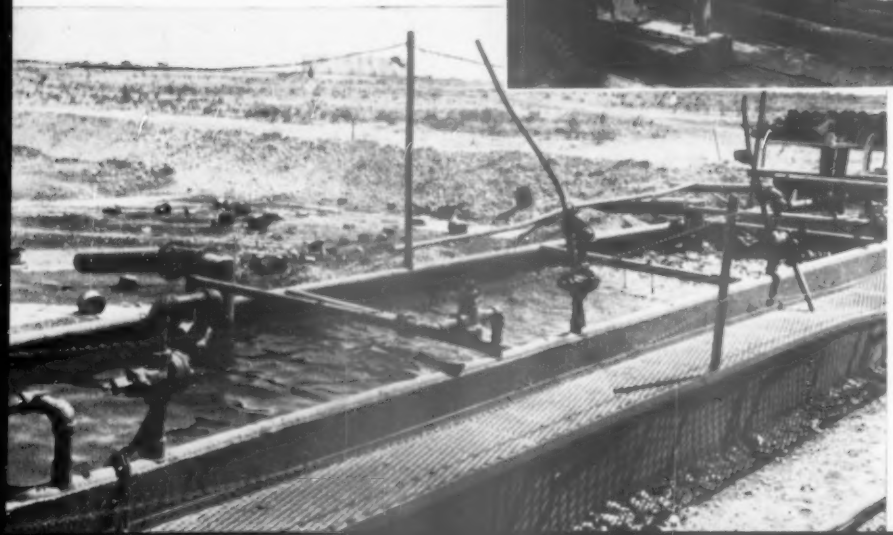
ARMOR-PLATED AGAINST MUD

Erosive drilling mud cannot eat away vital seating areas of Nordstrom Merchrome coated Hypreseal mudline valves like these installed on mud pump lines.



QUICK EMERGENCY OPERATION

It takes only a quarter turn to operate these Nordstrom three-way Hypreseal valves on blow-out preventer manifold. And Nordstrom lubricant keeps the valves ready to turn. Nordstrom valves on this service are a real safety factor.



NO PLACE FOR SEDIMENT

With Nordstrom valves there are no cavities, pockets or bonnet chambers to catch line sediment and build up a dangerous dam in the line. Nordstrom's straight-through flow plus unexposed seating surfaces are a natural for mudlines.

Nordstrom *Lubricated*

VALVES ARE BEST FOR MUD LINES

Nordstrom Hypreseal Mudline valves are built specifically for use with all types of drilling mud. Their design eliminates the causes for valve deterioration in this difficult drilling service.

Here are three of the reasons Nordstrom valves last up to 10 times as long – by actual field test as ordinary valves in drilling mud service . . .

1. Armor-plated with Merchrome

Nordstrom Hypreseal valves can be had with body and plug seating surfaces coated with an integral layer of Merchrome—an extremely hard non-galling corrosion and erosion resistant special alloy. This means that even the cutting action of abrasive drilling mud has a hard time making a dent in Nordstrom Merchrome valves.

2. Open or Closed in a Split Second

It takes only a quarter turn of the Nordstrom plug to open or close the valve—seconds instead of minutes, and how important that may be in an emergency! The hydraulic jacking action of the lubricant keeps the plug ready to turn.

3. No Sediment-Catching Pockets

Straight through flow with no body or bonnet chambers in which clogging deposits can build up. And, since the seating areas are out of the line of flow, wear is spared on vital parts.

Of course there are other advantages—the sealing film of lubricant around the ports for double tightness, the availability of special Nordstrom lubricants for drilling mud service, the simple, compact, space- and weight-saving design.

Sum it all up this way . . . for drilling service there are no valves like Nordstroms. The best way to convince yourself is to give them a try. Your Nordstrom sales engineer will help you choose the right types for your service. Rockwell Manufacturing Company, Pittsburgh 8, Pa.

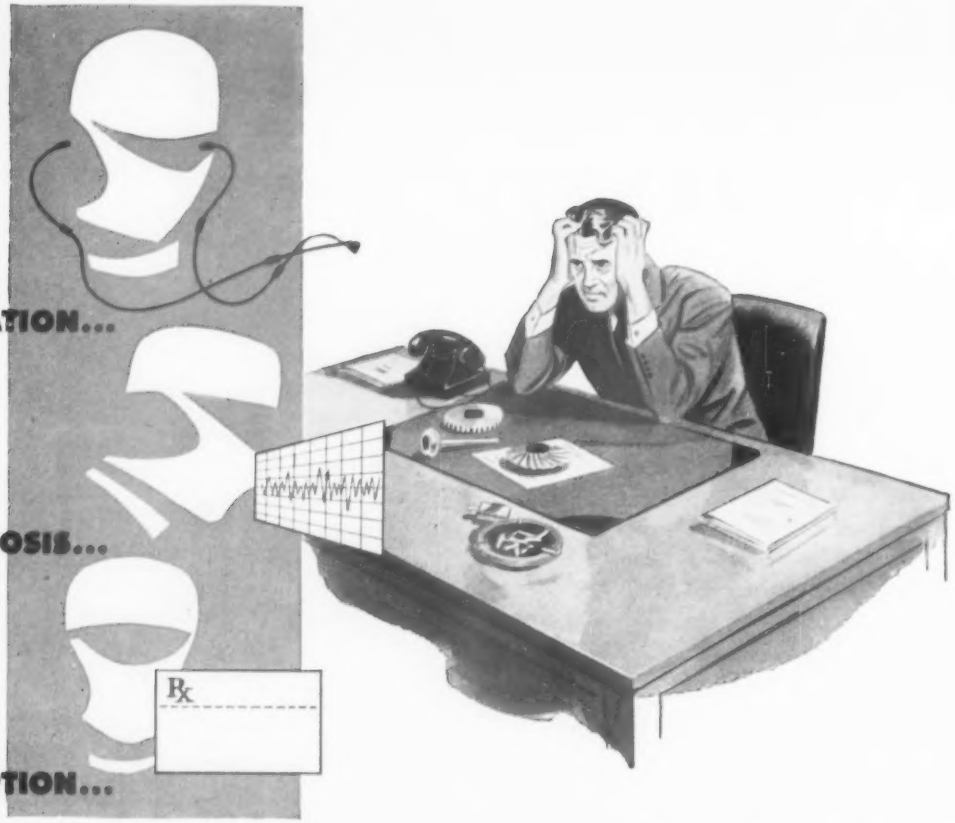
Merchrome hard-faced Nordstrom Hypreseal Mudline valve

Wherever you are in the oil fields, there's a supply store with Nordstrom valves and Nordstrom service nearby.

ROCKWELL Built
Nordstrom Valves

Lubricant-Sealed for Positive Shut-Off

Another Rockwell Product



Business "HEADACHES" relieved with Republic

3-DIMENSION METALLURGICAL SERVICE

First comes the examination of your steel "headache". . . machinability, or tool life, or heat treatment, or surface finish, or excessive rejects, or any of the problems that you face in production. Here's where you meet the Republic Field Metallurgist.

He discusses the symptoms with the other two members of Republic 3-Dimension Metallurgical Service . . . the Republic Mill Metallurgist and the Republic Laboratory Metallurgist. They look at your symptoms from all three angles . . . the best Republic Alloy Steel to do the job properly, to work efficiently in your plant to keep your costs down.

Then . . . back comes the Republic Field Metallurgist with recommendations that will give you the quality your product requires at the speed you need to show a profit.

Got a steel headache? Tell your Republic Sales Office representative about it . . . he'll have a Republic Field Metallurgist in your plant promptly.

LAB FIELD MILL

3-DIMENSION Metallurgical Service

. . . combines the extensive experience and coordinated abilities of Republic's *Field*, *Mill* and *Laboratory* Metallurgists with the knowledge and skills of your own engineers. It has helped guide users of Alloy Steels in countless industries to the correct steel and its most efficient usage. IT CAN DO THE SAME FOR YOU.

REPUBLIC STEEL CORPORATION

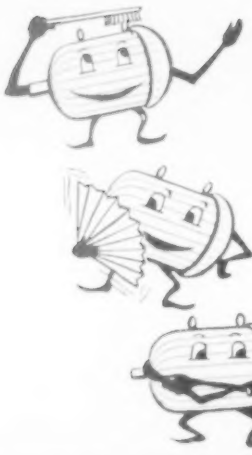
Alloy Steel Division • Massillon, Ohio

GENERAL OFFICES • CLEVELAND 1, OHIO

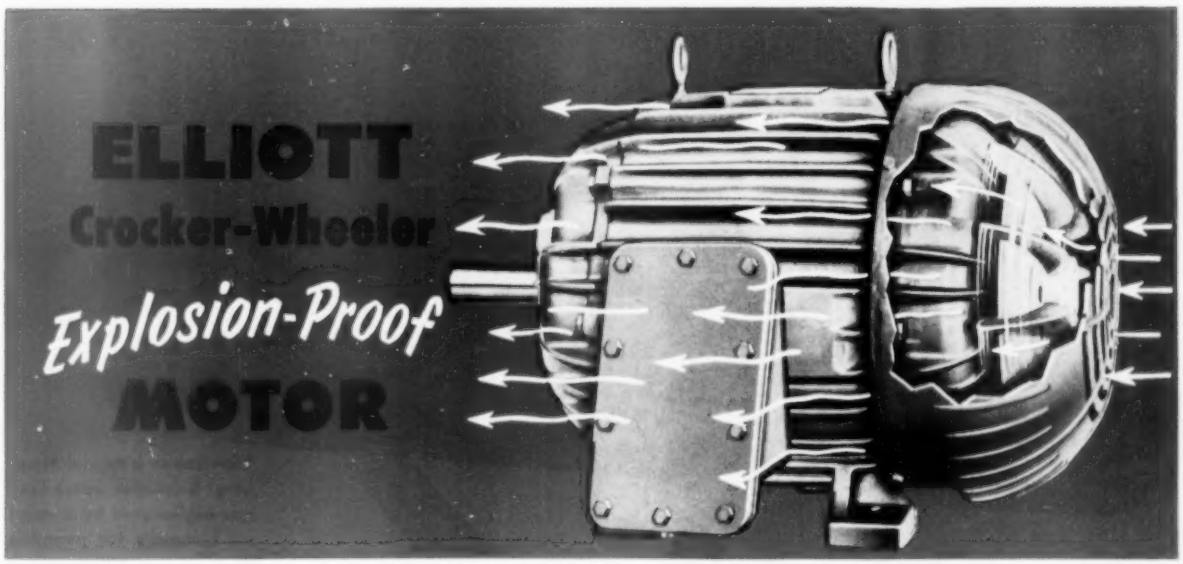
Export Department: Chrysler Building, New York 17, N.Y.

REPUBLIC STEEL

Republic ALLOY STEELS

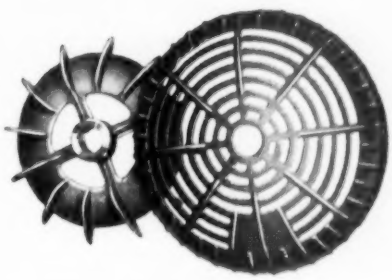


It's self-cleaning!
It's self-cooling!
It's explosion-proof!



Here's a totally-enclosed motor that acts as its own heat exchanger, driving a directed blast of air around the *outside* of the motor along the full length of the heat-radiating fins. This air blast not only sweeps off heat as fast as it is developed, but also prevents the settling of dust or other material on the motor, building up an additional barrier to the release of heat.

Now available with explosion-proof enclosure, underwriters approved, the Elliott Crocker-Wheeler Sealedpower is an ideal motor for hazardous locations, indoors or out. Refineries, natural gasoline plants, pipe lines, chemical plants, flour mills — everywhere in fact where totally-enclosed motors with explosion-proof qualities are a must — are using rugged Elliott C-W Sealedpower motors with full satisfaction. In NEMA frames, ratings to 100 hp. For full data, contact your nearest Elliott district office or write Elliott Company, Jeannette, Pa.



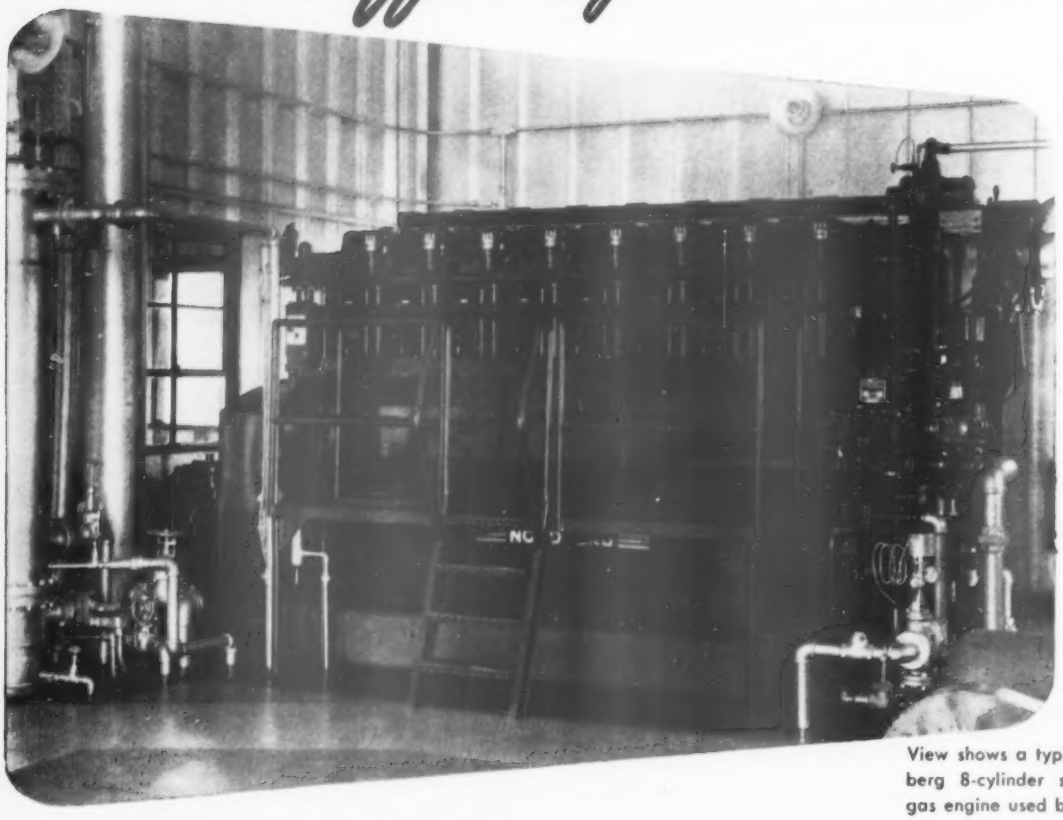
THE FAN AND COWL. *Fan is one-piece, non-sparking bronze. The cowl is of gray cast iron, so designed as to direct the flow of cooling air along the outside surface of the frame.*

ELLIOTT Company

CROCKER-WHEELER DIVISION

W3-9

Put more efficient power to work...



View shows a typical Nordberg 8-cylinder spark-fired gas engine used by a major oil company for pumping crude oil.

...with NORDBERG *SUPAIRTHERMAL* Spark-Fired Gas Engines

HIGH thermal efficiency of power-packed Nordberg four-cycle *SUPAIRTHERMAL* Spark-fired gas engines, in excess of 40% at full load, turns low fuel consumption into profit dollars. Designed and built to give years of dependable, economical service, Nordberg Spark-fired Gas Engines are available in sizes up to 4260 horsepower.

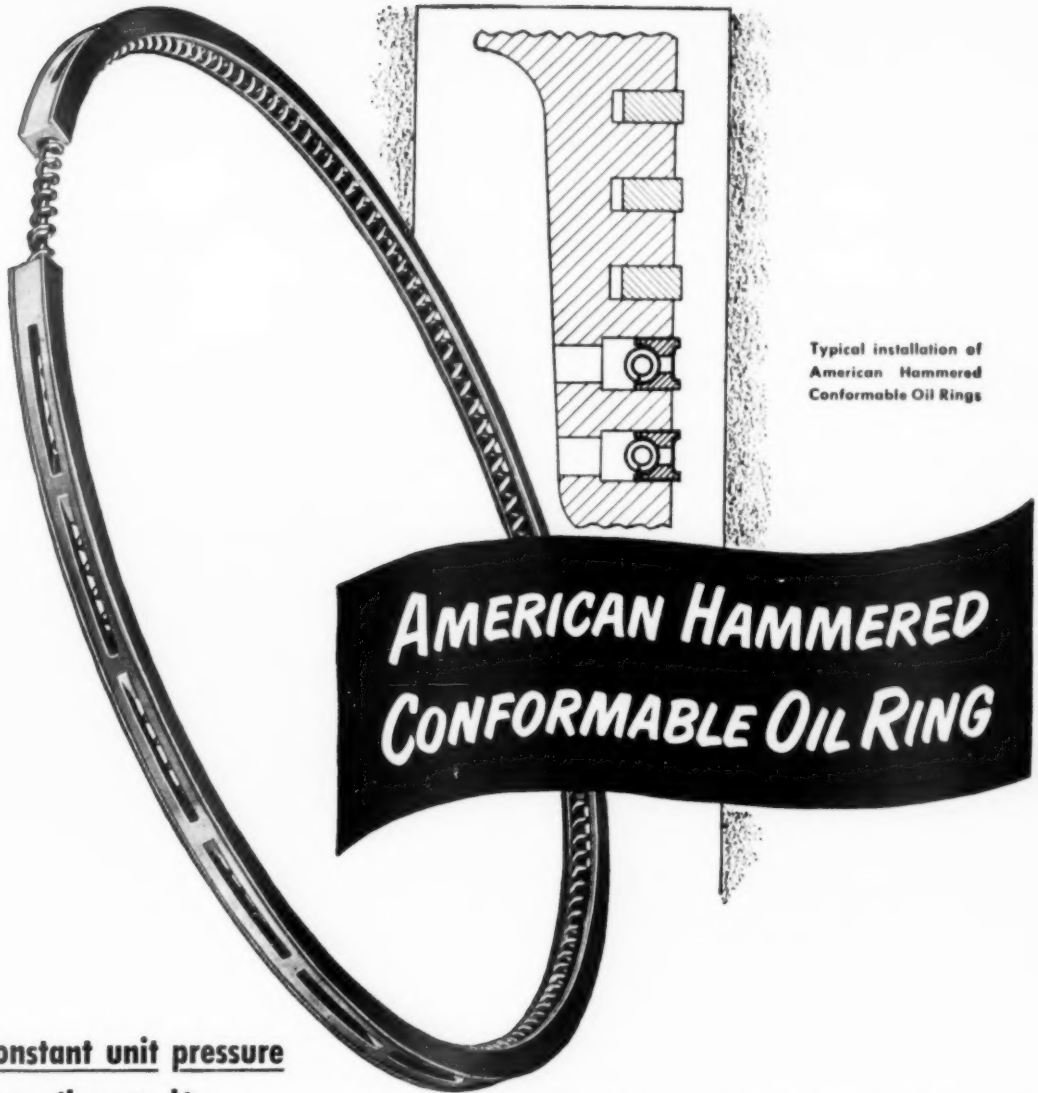
For further information write for Bulletin 221.

NORDBERG MFG. CO., Milwaukee, Wisconsin

NORDBERG

DIESEL • DUAFUEL® AND SPARK-FIRED GAS ENGINES

0253



Typical installation of American Hammered Conformable Oil Rings

AMERICAN HAMMERED CONFORMABLE OIL RING

Insures constant unit pressure for positive oil control!

You keep your oil consumption down when you install Koppers American Hammered Conformable Oil Rings! This service-tested piston ring conforms readily to meet cylinder distortion because its flexible cast iron member is pressed outward by an abutment type spring which exerts uniform radial pressure around the entire circumference.

Narrow bearing surfaces on either side of the channel give the ring a uniform unit pressure on the cylinder, enabling it to seat promptly and assuring maximum removal of excess oil throughout its lifetime. And the Conformable Oil Ring has a longer useful life because its low spring rate and uniform lands result in negligible changes in pressure as the ring wears

Easily installed, it is ideal for both 2-cycle and 4-cycle Diesel & Gas engines; comes in 4" to 25" diameters with a minimum width of ¼". Write, wire or phone us today for full information on how the Conformable Oil Ring can improve *your* operation . . . or for expert help in *any* piston or sealing ring problem. KOPPERS COMPANY, INC., *Piston Ring Dept.*, 1556 Hamburg Street, Baltimore 3, Maryland.

KOPPERS®

METAL PRODUCTS DIVISION • KOPPERS COMPANY, INC. • Baltimore, Maryland

This Koppers Division also supplies industry with Fast's Couplings, Aeromaster Fans, Koppers-Elex Electrostatic Precipitators and Gas Apparatus.

Engineered Products Sold with *Service*

AMERICAN HAMMERED *Industrial Piston Rings*

KOPPERS COMPANY, INC., *Piston Ring Dept.*, 1556 Hamburg Street, Baltimore 3, Md.

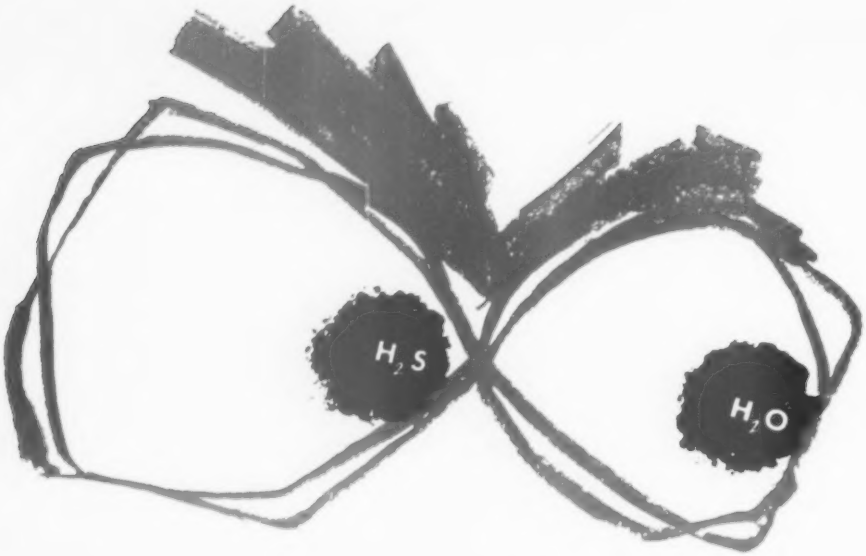
Gentlemen: Please send me full information on your Conformable Oil Ring.

Name .....

Company .....

Address .....

City ..... Zone ..... State .....



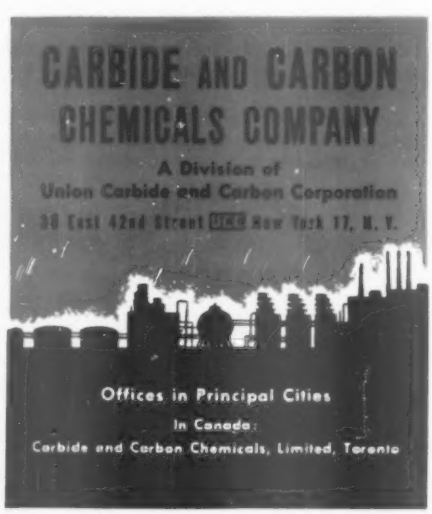
H_2S and H_2O need not cause you any Woe...

When you use	To remove
MONOETHANOLAMINE or DIETHANOLAMINE	H_2S
DIETHYLENE GLYCOL or TRIETHYLENE GLYCOL	H_2O

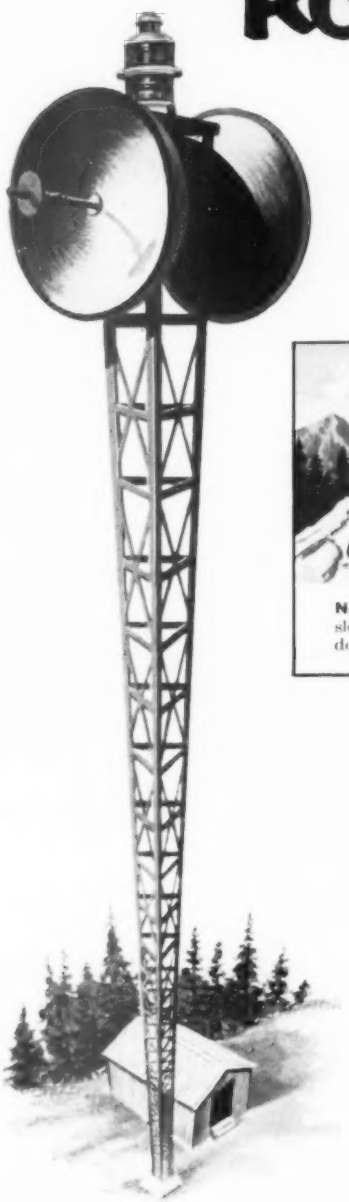
More corrosive hydrogen sulfide is being removed from hydrocarbon gases with monoethanolamine and diethanolamine than by any other method. Some companies are even realizing a profit from this impurity by converting it to elemental sulfur or selling it as concentrated H_2S.

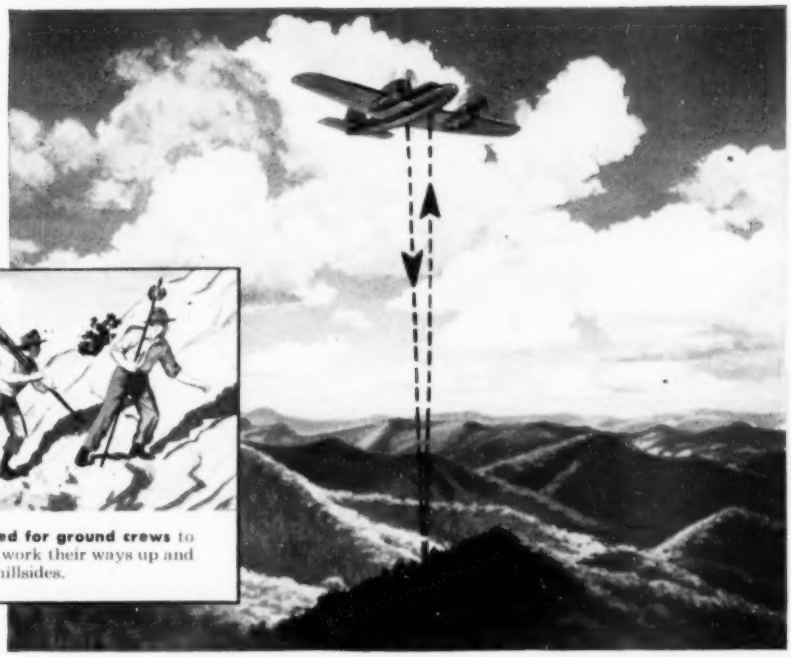
And water can readily be removed from high pressure transmission lines with diethylene glycol and triethylene glycol. Thus you maintain capacity and avoid pipe line and regulator clogging.

Twenty years ago the introduction of monoethanolamine, diethanolamine, diethylene glycol, and triethylene glycol by Carbide and Carbon Chemicals made possible efficient and economical methods of removing H_2S and water from hydrocarbon gases. During this period we have compiled considerable data on the properties and use of these helpful chemicals. If you are constructing new facilities, or are replacing, enlarging, or modernizing your present equipment, we believe these data will save you time and money.


CARBIDE AND CARBON CHEMICALS COMPANY
A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street New York 17, N. Y.
Offices in Principal Cities
In Canada:
Carbide and Carbon Chemicals, Limited, Toronto

RCA MICROWAVE





No need for ground crews to slowly work their ways up and down hillsides.

Radar signals provide precise data on contour of earth beneath proposed path of a microwave beam.

RCA AERIAL SURVEY
speeds installation ... insures accuracy

For the ultimate in microwave planning, RCA offers the important advantages of fast, accurate aerial survey.

Flying a simulated path of the microwave beam, ground elevations are charted by continuous readings from a vertical radar system. Recording instrumentation enables the survey team to plot an accurate route—and an *alternate route*—at high speed. By direct observation and aerial photography these experts select the most economical, easily accessible sites. An unobstructed microwave route is plotted in a fraction of the time normally required—without the premature publicity that often results from surveyors' operations.

For dependable communication, proved on existing systems, call an RCA Microwave Specialist at the nearest Regional Office, or MAIL COUPON.

• • •

Check RCA 2-way radio for proved dependability in mobile communications.

And remember, only RCA can provide the nationwide service facilities of the RCA Service Company.

RADIO CORPORATION of AMERICA
COMMUNICATIONS DIVISION **CAMDEN, N. J.**

Communications Division
Radio Corporation of America
Dept. 89RB, Building 15-1
Camden, N. J.
Please send me your free booklet on:

- ☐ RCA Microwave
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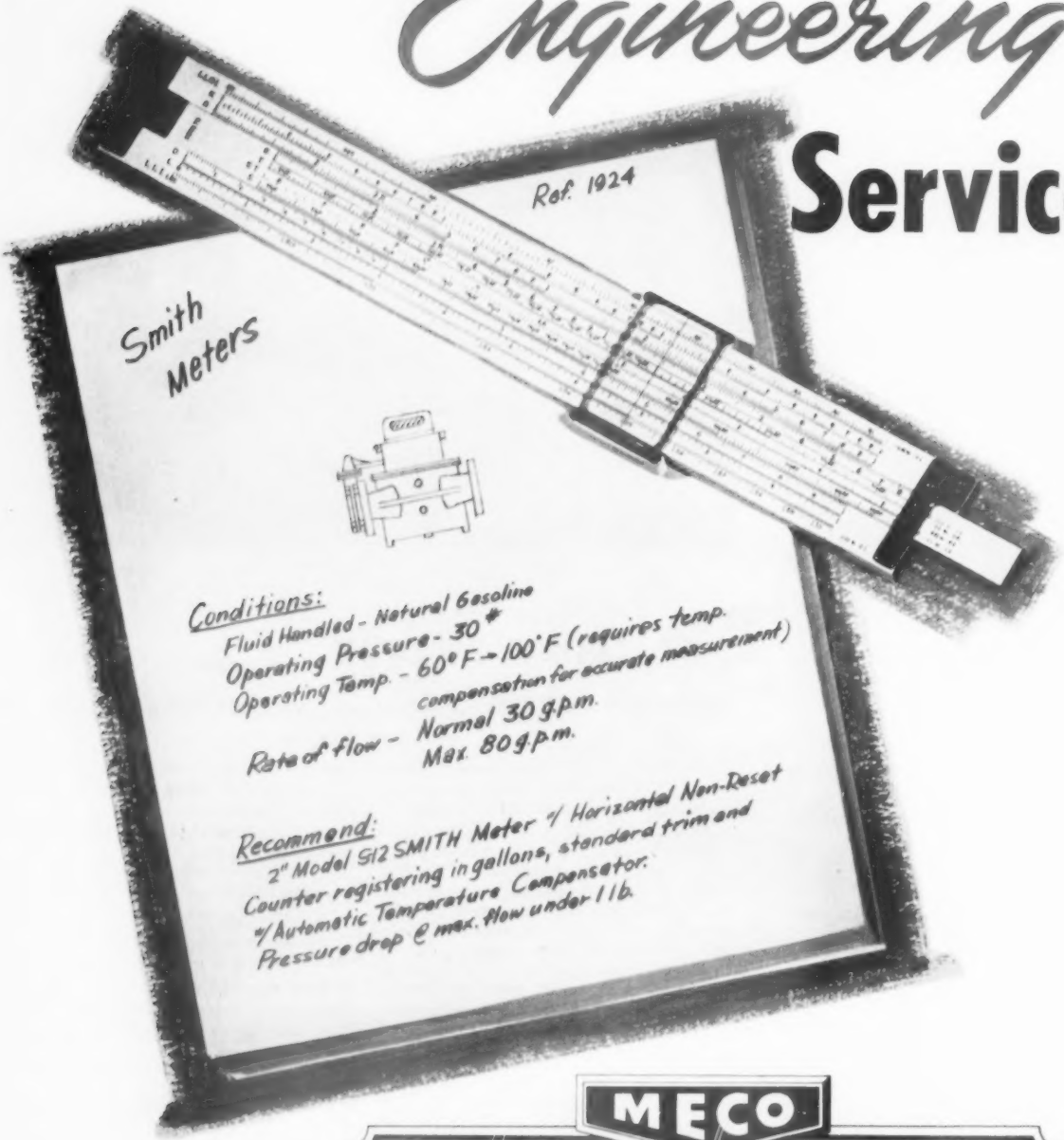
Equipment with *Engineering* Service


Ref. 1924
Smith Meters
Conditions:
Fluid Handled - Natural Gasoline
Operating Pressure - 30 #
Operating Temp. - 60° F → 100° F (requires temp. compensation for accurate measurement)
Rate of flow - Normal 30 g.p.m.
Max. 80 g.p.m.
Recommend:
2" Model S12 SMITH Meter w/ Horizontal Non-Reset Counter registering in gallons, standard trim and w/ Automatic Temperature Compensator.
Pressure drop @ max. flow under 1 lb.

MECO

MAINTENANCE *Engineering* **CORPORATION**

P. O. BOX 2637

3711 CLINTON DRIVE
HOUSTON, TEXAS

MODERN FARMERS like J. A. Parks of Maloy, Iowa, using the gang plow above, can produce much more in much less time than the farmer of just a few years ago. In the horse-powered days of farming it took as many as 35 man-hours to produce and harvest an acre of corn. Now, on many mechanized farms, it is done in fewer than 11 man-hours. In addition, the shift from animal power to machine power released about 72,000,000 acres of cropland from producing feed for horses and mules to producing food for the nation's tables.

WHAT EVER HAPPENED TO THE MAN BEHIND THE PLOW?

THE "man behind the plow" is still very much in the picture, but he's *up front now.* And because he is, you and your family—even the world—are better fed today.

Not many years ago the American farmer walked behind the old horse-drawn plow, worked longer hours and produced much less than he does today. But that was before the development of the "hired hands" that never tire—the tractors, trucks and implements which do the work of many men, and the petroleum fuels and lubricants which keep them running.

In the last 50 years or so, while America's population was growing from 75,000,000 to more than 150,000,000 a remarkable change was taking place in agriculture. Today 8,000,000 *fewer* persons on America's farms are producing food for 75,000,000 *more* Americans.

Yet America has never been better fed. It has never been better equipped to export needed foods to other countries for normal requirements, or to combat famine—an ally of communism—wherever it appears.

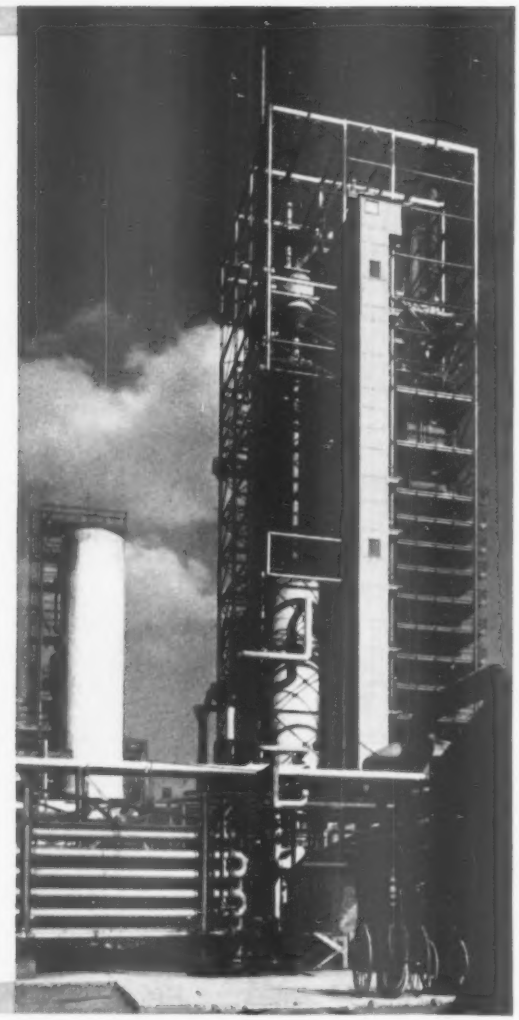
Never have so few fed so many so well.

To help make ours a more abundant land, Standard Oil pioneered in delivering petroleum products right to the farmers' doors in the quantities needed and at reasonable prices. This on-the-spot delivery, started way back in 1910, was vital to the rapid growth of mechanized farming in the Middlewest—one of the most productive agricultural regions in the world.

So many rural customers have learned to depend on Standard Oil products and services that we now serve far more Midwestern farmers than any other oil company.

Standard Oil Company (INDIANA)

Forty billion barrels ago—



Measured in years, it is less than a century since Colonel Drake drilled the first oil well, in 1859. Measured in terms of the gigantic American petroleum industry which grew from his pioneering enterprise, the August day when his well spurted forth the long-sought oil was more than forty billion barrels ago.

Two thousand barrels was the output in 1859. About two billion barrels now come yearly from American wells to meet the demands of the modern motor and the varied other uses of petroleum products.

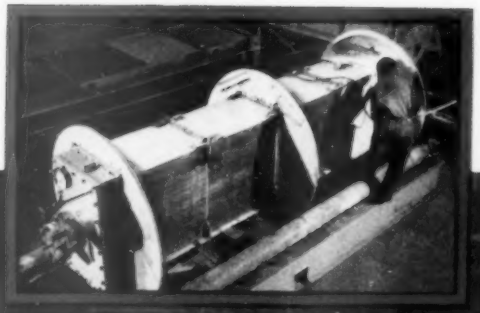
For decades, Sun Ship has played an important part in construction of the refinery equipment . . . fractionating towers, condensers, pressure vessels, machinery and other equipment . . . to meet these demands. The facilities, modern manufacturing methods and skilled personnel at the great Sun Ship plant provide a combination that has consistently shown its ability to serve the petroleum, chemical and petrochemical industries in the task of building a greater America.

Sun

SHIPBUILDING & DRY DOCK COMPANY

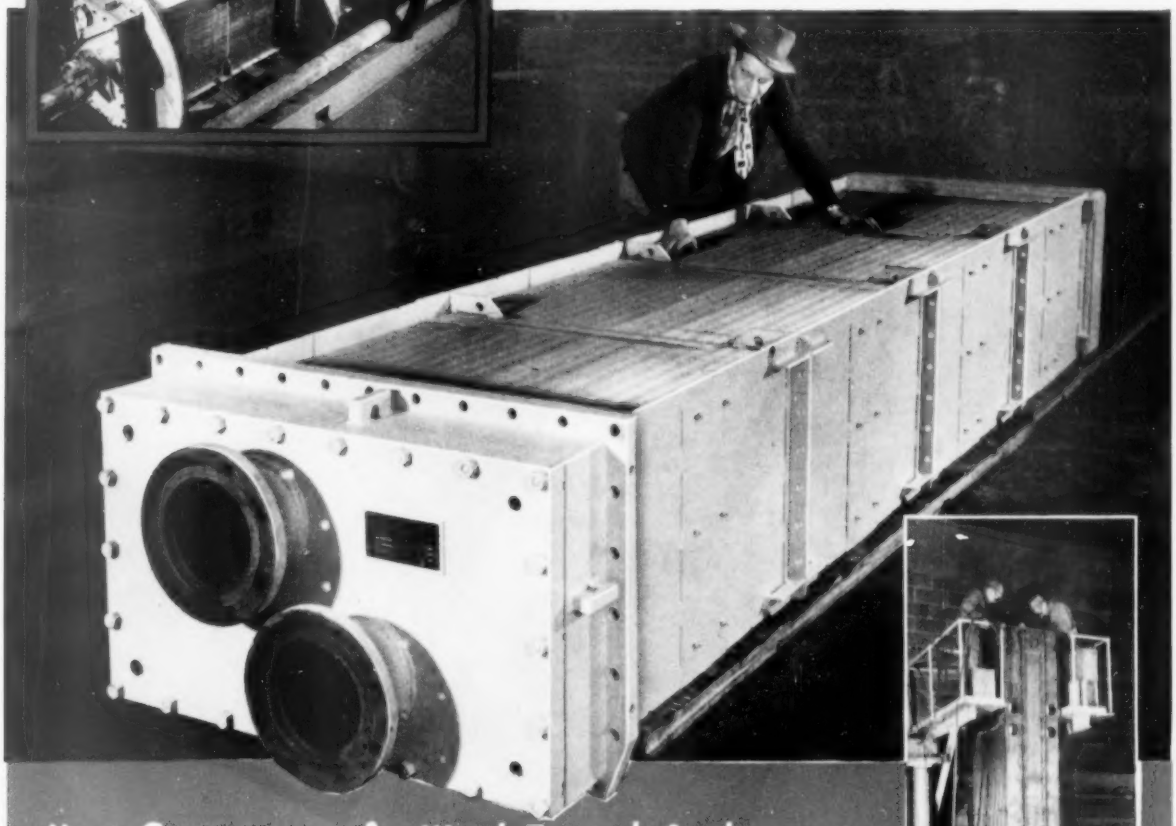
ON THE DELAWARE (SINCE 1916) CHESTER, PA.

25 BROADWAY • NEW YORK CITY

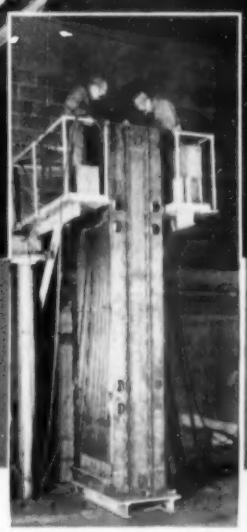


Each heat exchanger is individually hydrostatically tested to insure against leakage during operation. While under test, the by-pass baffles are welded on the unit.

One of the many wind tunnel heat exchanger sections, ready for shipment and installation in the Langley Aeronautical Laboratory supersonic wind tunnel, Langley Field, Virginia.



New **Supersonic** Wind Tunnel Coolers are A. O. Smith **Engineering Achievement**



Assembling tubes into the tube headers for one of the heat exchanger sections.

All wind tunnel coolers for the new supersonic wind tunnel under construction at Langley Aeronautical Laboratory of NACA, Langley Field, Virginia, were supplied by us.

A. O. Smith engineers conceived an original design in these heat exchangers, incorporating many advantages. The most important ones are:

1. High efficiency through balanced distribution of surface and flow areas.
2. Removable tube bundles.
3. Safety from air contamination by water, through elimination of bolted joints inside the tunnel and placing all water lines and connections outside air chamber.

INDUSTRY COMES TO A. O. SMITH WITH HEAT EXCHANGER PROBLEMS

These and many similar features make this one of the most advanced engineering feats in cooling provision for wind tunnels.

Besides manufacturing varying sizes and arrangements of heat exchangers, we also designed cooler housings, accessory equipment, and air by-pass system, calculated ducts and provided installation.

This is an excellent *example* of the completeness and flexibility of A. O. Smith engineering which is available to you to help solve YOUR heat exchanger problems . . . available through our nearest office, listed below.

Research and Engineering Building

A.O.Smith

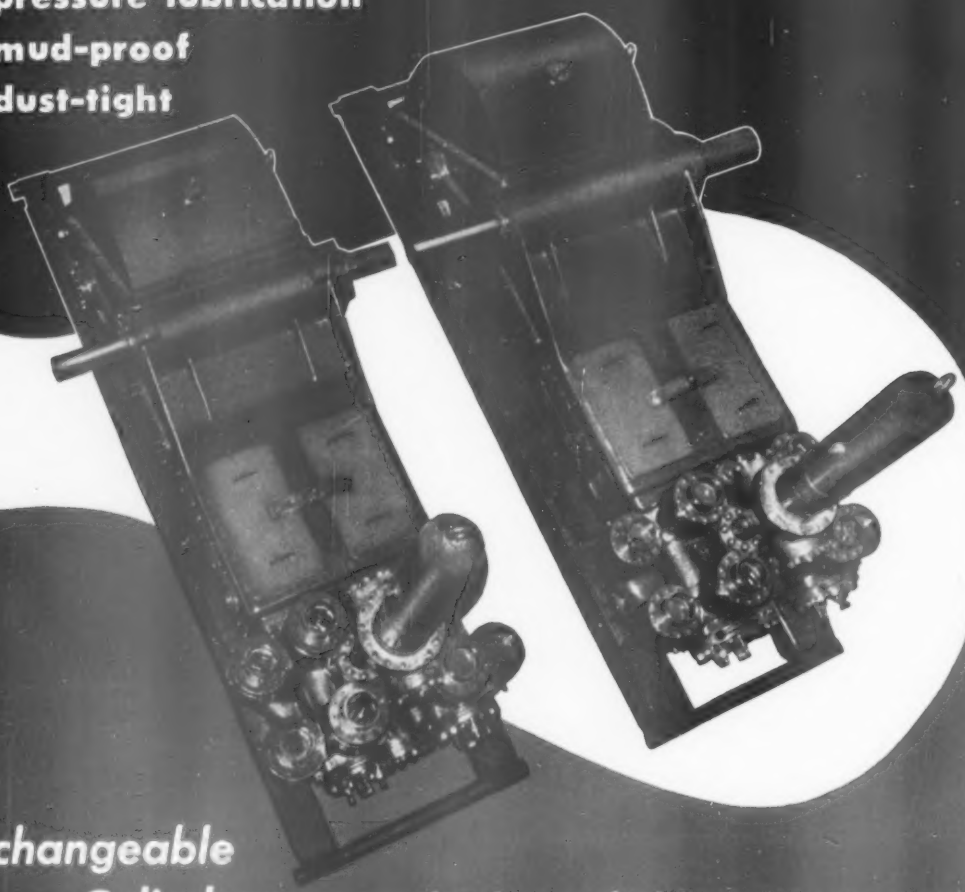
CORPORATION

VESSELS • HEAT EXCHANGERS

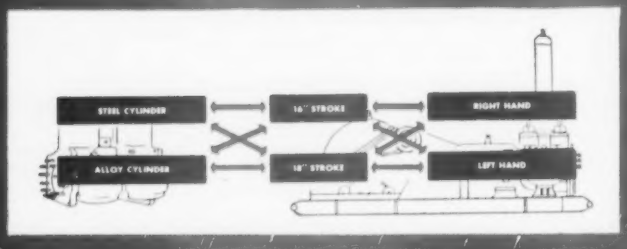
Chicago 4 • Cleveland 15 • Dallas 2 • Denver 2 • Houston 2
Los Angeles 22 • Midland 5, Texas • New Orleans 12
New York 17 • Pittsburgh 19 • San Francisco 4 • Seattle 1
Tulsa 3 • Washington 6, D.C.
International Division: P.O. Box 2023, Milwaukee 1, Wis., U.S.A.

For Your Peace of Mind...

. . pressure lubrication
. . mud-proof
. . dust-tight



Interchangeable Cylinders ...for faster field maintenance



one steel or alloy fluid cylinder
— fits either right- or left-hand side
— of either 16" or 18" pump

GOOD REASONS FOR CHOOSING
GARDNER-DENVER
MUD PUMPS

Write for Bulletins FX-10 and P-70.

GARDNER-DENVER SINCE 1859

Gardner-Denver Company, Quincy, Illinois
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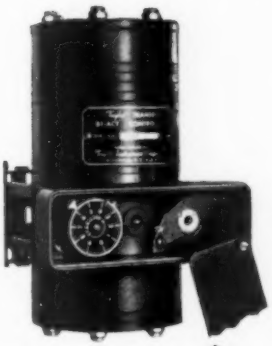
Export Division: 50 Rockefeller Plaza,
New York, N. Y.

Republic Supply Co., (Of Calif.),
3500 S. Eastland Ave., Los Angeles, Calif.

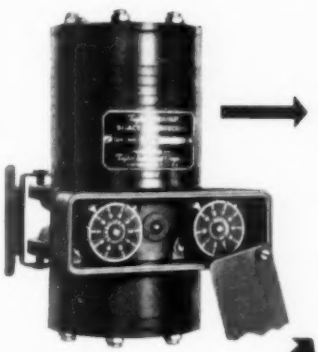
THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS

Plug-in feature fits all 3

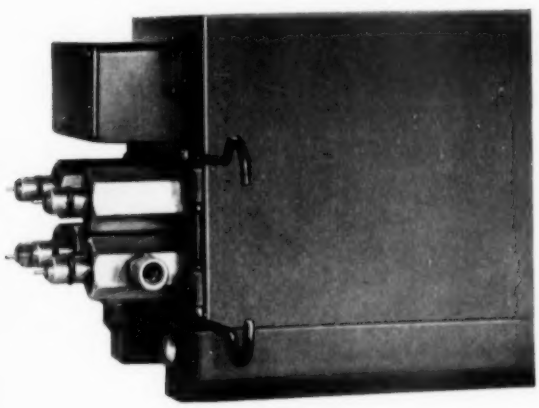


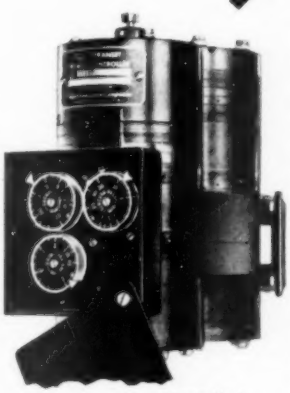
One-knob BI-ACT*, two-knob BI-ACT and TRI-ACT* Controllers completely interchangeable on TRANSET* Indicators, Recorders and field-mounted manifolds, thanks to universal PLUG-IN feature.

The one-knob BI-ACT Controller is designed for use in industrial processes with short time lags, such as close-coupled liquid flow, fast pressure and comparable temperature problems. Combines simplicity of adjustment and economy.



The two-knob BI-ACT Controller will cover the full range of reset rate and proportional response adjustments. This makes it more satisfactory for those jobs that have longer time lags, and where close response adjustments are essential to good performance.





The brand new TRI-ACT Controller combines all three response adjustments (gain, reset rate and Pre-Act response). It is the most complete controller, giving the very best control on the more complex processes, particularly those with long time constants, and load changes requiring both derivative and reset adjustments. Gives faster recovery on load changes; start-up without overpeaking; the benefits of automatic reset without its evils.

*Trade Mark

Plug-in, Taylor's new idea in panel instrumentation gives you simplicity of installation and maintenance; economy in installation and in panel space; and minimum down time for maintenance.

You can change from the simplest to the most complete control, or from indicator to recorder or vice versa, by simply unplugging one unit, plugging in another—in a matter of seconds. Only one simple rectangular panel opening is required for mounting both controller and receiver (recorder or indicator). Does not require welding or drilling of holes.

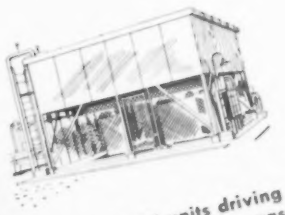
Only 3 piping connections required: air supply, controller output and variable transmitter. All other connections are made automatically, in the self-sealing manifold.

Panel space is not only reduced by plug-in feature, but adjustments and maintenance are even more convenient.

Write for full information on Taylor Plug-In TRANSET Control—it may well be the answer to your problem. Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada.

Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

Taylor Instruments mean ACCURACY FIRST



Cleveland CU units driving fans in an Oklahoma gas cooler. Cleveland Worm Gear Cooling Tower Drives are made in sizes 50 CU to 500 CU inclusive.

CLEVELAND driven cooler cools off natural gas

EFFICIENCY in this gas cooler depends upon steady operation of its heavy-duty fan. So to insure uninterrupted service regardless of weather and every other condition, an Oklahoma gas company equipped this booster station with four Cleveland CU worm gear speed reducers.

Cleveland CUs are especially designed and built for heat exchanger service—wherever fans are required to move large volumes of air efficiently. Outdoors or under shelter, no matter where located—driving air-cooled or water-cooled units—Clevelands are easy to install and maintain. They offer a minimum of trouble because they are properly designed and ruggedly built, with a minimum of moving parts.

Why not get the Cleveland Cooling Tower Drive story first hand? See the Cleveland representative in your area. He's there to help you. Or, write for new CU Bulletin 135R. The Cleveland Worm & Gear Company, 3286 East 80th Street, Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.

Oil helps him dig deep treasure...ore!

Each year, America's miners send up from below ground over 79 million tons of ore. The metal from this ore makes a million things – from bathtubs to battleships. Things that help us live better, things that help make our country strong.

Oil is with our miners every step of the way. Oil helps them dig, drill, load and haul. And much of this vital oil comes from The Texas Company – for years one of the leading suppliers to the nation's mining industry.

The Texas Company

TEXACO

Know the best way to get the best tube steel for you? Ask the experts!

This month's report is on:

SICROMO 2

Has outstanding surface and structural stability at 1200°F. Has better oxidation and corrosion resistance than 2% Cr.-Mo. steel. Recommended for service up to 1200°F. as tubes in cracking coils, reforming units, heat exchangers, vapor line and hot oil piping. Also as return-bend forgings for oil heaters.

ONE OF 24 TIMKEN HIGH TEMPERATURE STEELS

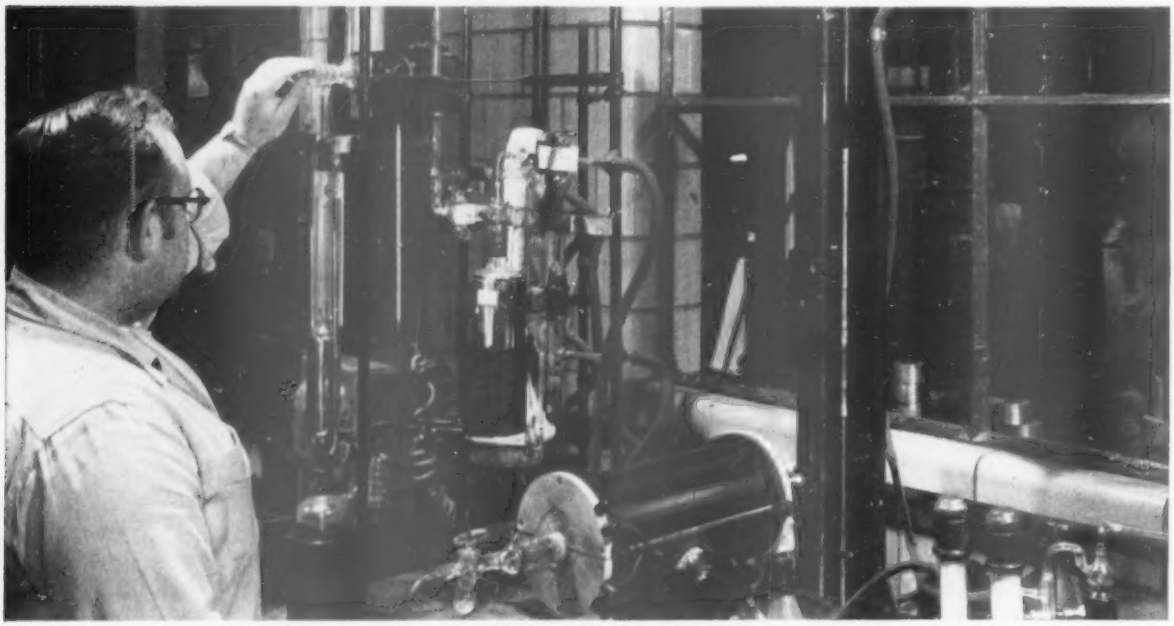
Carbon	Sicromo 2	Sicromo 5S	18-8 Ti
Carbon-Mo.	Sicromo 2½	Sicromo 5MS	16-13-3
DM-2	2½% Cr.-1% Mo.	Sicromo 7	25-20*
Silmo	Sicromo 3	Sicromo 9M	25-12*
DM	4-6% Cr.-Mo.	18-8 Stainless	35-15**
2% Cr.-Mo.	4-6% Cr.-Mo.-Ti.	18-8 Cb	16-25-6**

** Available as seamless tubing on an experimental basis only.*
***Not available as seamless tubing.*

SEVERAL high temperature tube steels may solve your heat, pressure, corrosion and oxidation problems. But only one steel will give you maximum tube life per dollar —the best life/cost ratio.

The best way to get this steel is to ask the experts—the metallurgists of The Timken Roller Bearing Company. Backed by more than 20 years of steel research and experience, they're recognized authorities on high temperature steels. With 24 different analyses to choose from, they'll help you select the best tube steel for your particular application. And uniform tube quality is assured by the Timken Company's rigid quality control from melt shop through final tube inspection.

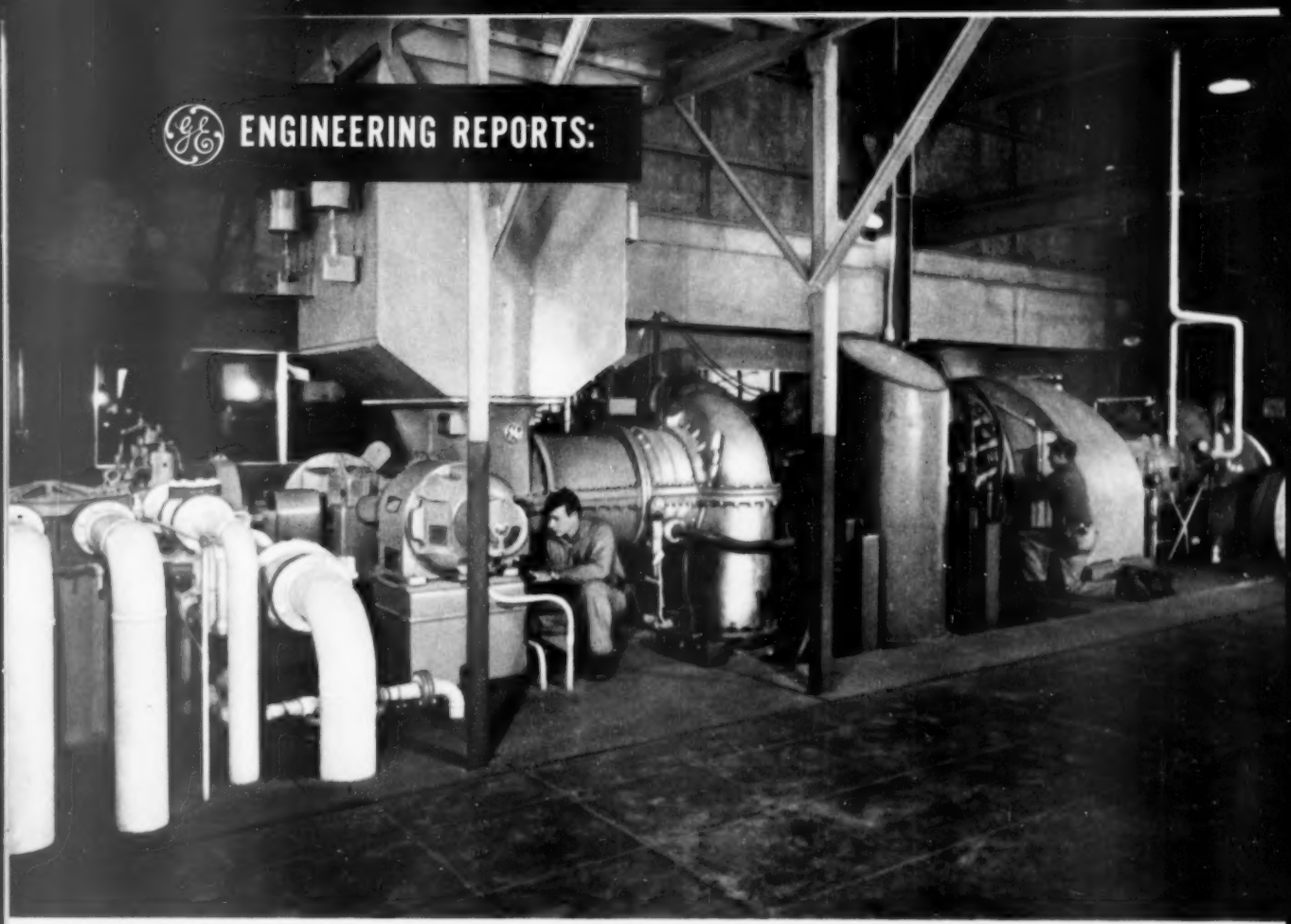
Let our "RSQ"—Research, Supply, Quality—solve your tube problems. *Ask the experts!* The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".



Chlorination apparatus purifies extracted non-metallic residues to determine steel cleanliness. Research like this helps assure the Timken Company's leadership in high temperature steels.

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING



START-UP of first G-E pipeline turbine went off smoothly, thanks to months of careful planning by El Paso and G-E engineers.

First of 28 combustion gas turbines goes "on the line" for El Paso

G-E turbine package plays key part in development of Permian basin

To serve California, Arizona, New Mexico, Nevada and West Texas, El Paso Natural Gas Company recently completed the first of ten new booster stations. Ultimate goal: 300 million additional cubic feet per year. G-E combustion gas turbines—specially designed for efficient gas pipeline pumping—will develop a total of 140,000-hp to help increase average system pressure from 690 to 775 pounds.

Pioneering effort answers industrial demand

The first station to go on pump—located at remote Cornudas, Texas—houses three 5700-hp G-E machines and their associated electric equipment. These are forerunners of a 28-unit system to be in operation within six months. Thanks to El Paso's timely expansion, trade in areas served has been stimulated, and demands for gas are being met.

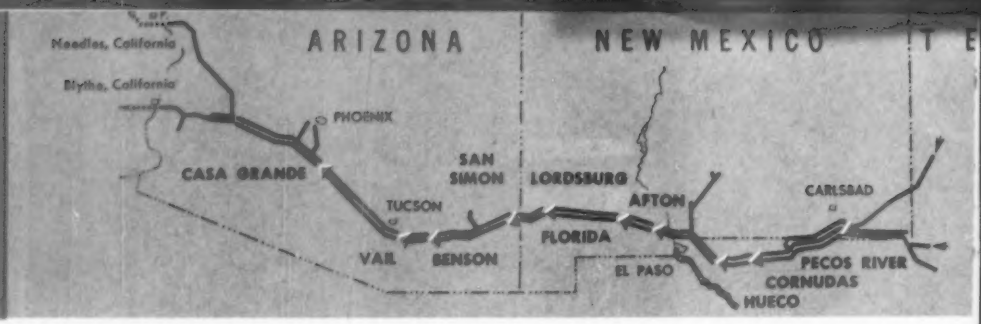
Turbine solves many operating problems

Cornudas station, located 60 miles out in the Texas desert, dramatically illustrates the inherent adaptability of the G-E gas turbine to pipeline pumping. The three 5700-hp units require only a negligible amount of cooling water. Year-round operating and maintenance costs will be low—a very small crew is all that's needed. Lubricating oil consumption is low. And in winter, when demand is highest, each turbine will deliver approximately 25 per cent more power without additional investment.

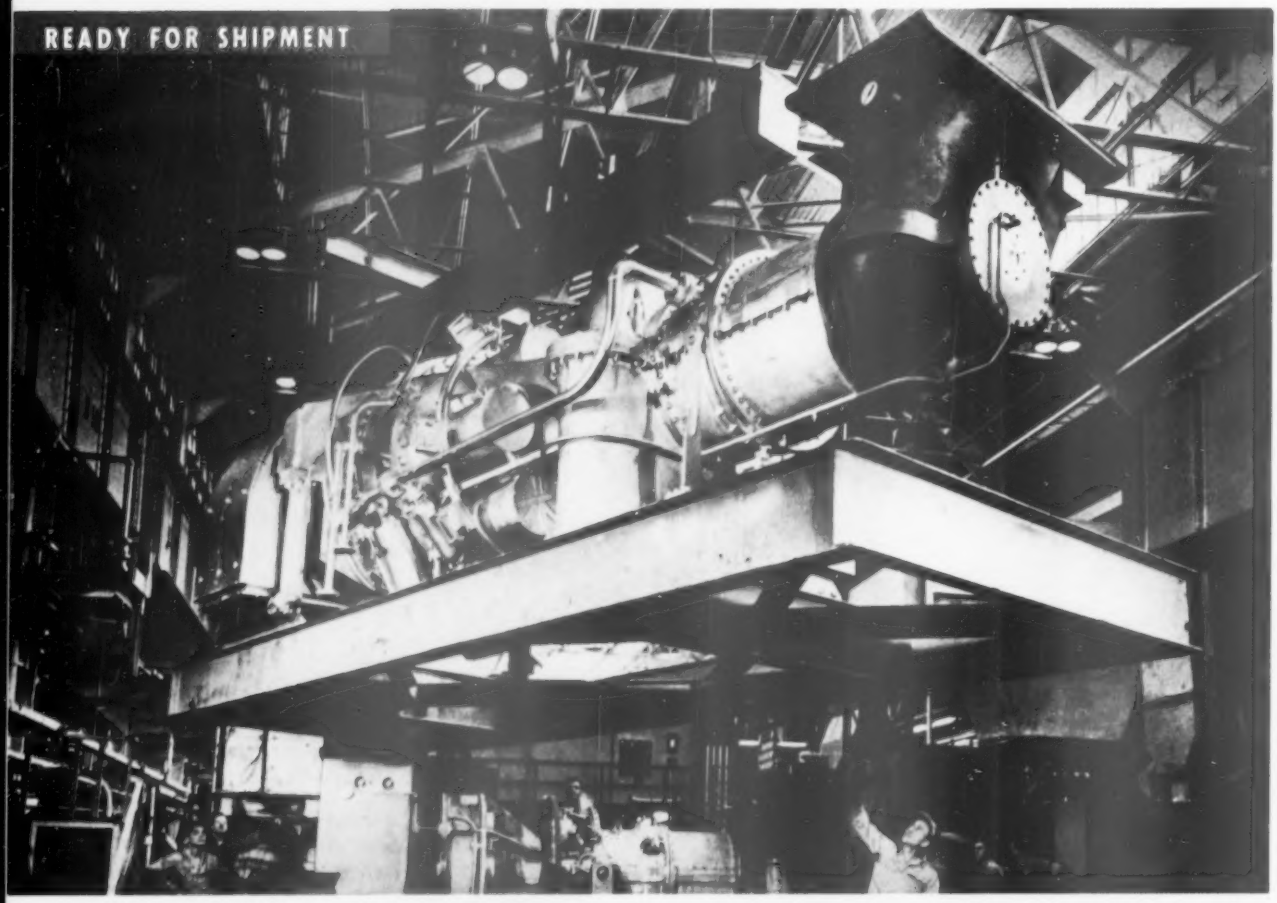
GENERAL ELECTRIC

TURN PAGE FOR PHOTO REPORT

PHOTO REPORT OF G-E PIPELINE TURBINE AT EL PASO



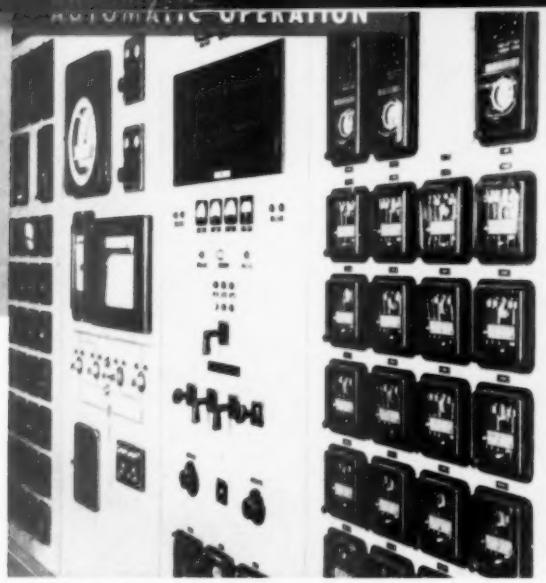
1. **BIG BOOST IN GAS VOLUME** will take place in El Paso's Southern Mainline when the 28 new G-E gas turbines are installed. This map shows location of turbine compressor stations.



2. **THE FIRST GENERAL ELECTRIC GAS TURBINE** for pipeline pumping swings off the production line in one compact unit.

3. **FULLY TESTED** and ready to install, the turbine is skidded off a flat car in El Paso and hauled to Cornudas by trailer.

4. **CRANE HOISTS TURBINE** into position. A single bedplate, plus a comparatively low weight simplifies installation.

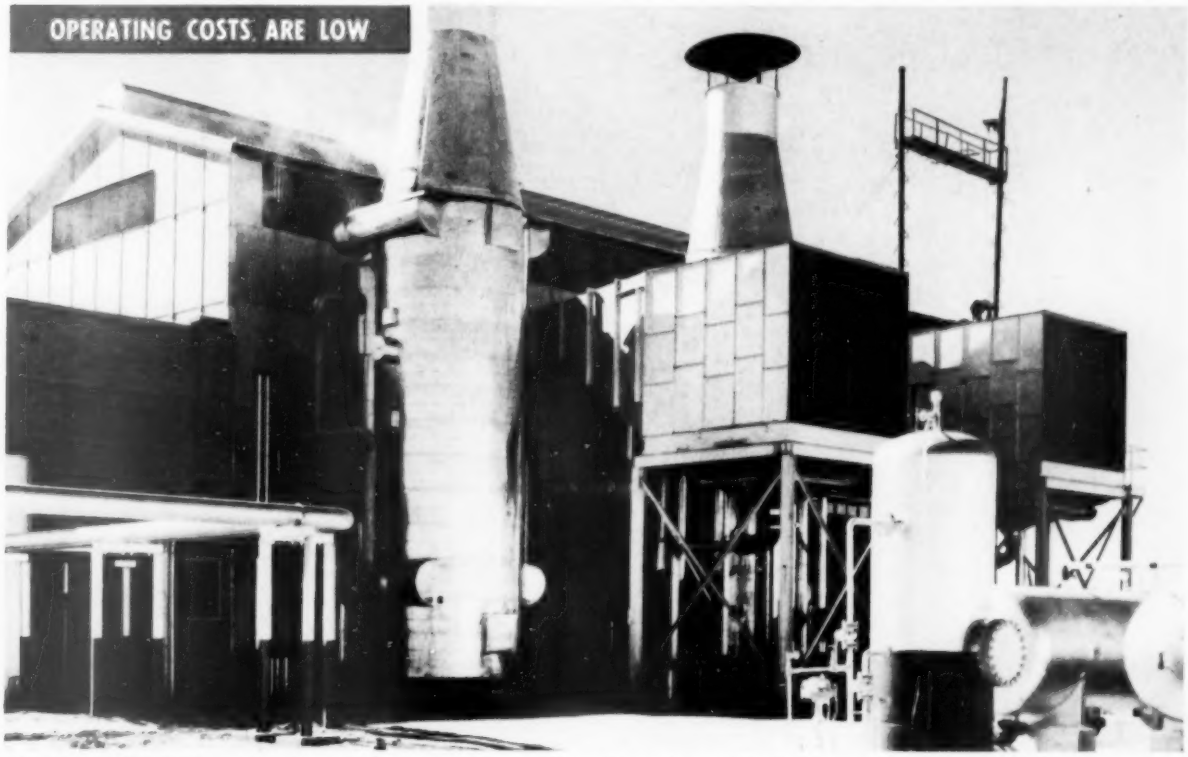


5. **CONTROL OF THE TURBINE** is centered in this operator's duplex control board. A single switch controls entire operating sequence. Station discharge pressure is held automatically.

6. **FEW STATION AUXILIARIES** are required, and they are controlled automatically from these Cabinetrol* panels. These custom G-E units help protect equipment and personnel.

*Trade-mark of the General Electric Company

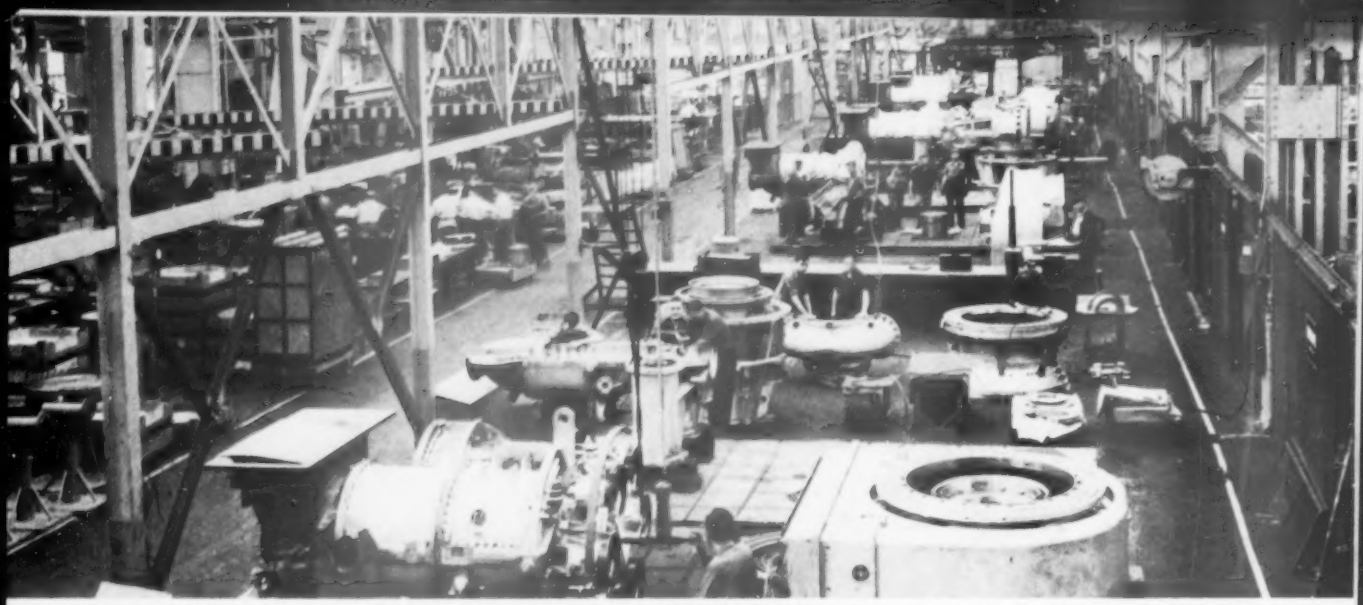
OPERATING COSTS ARE LOW



7. **FUEL ECONOMY** is achieved by use of waste-heat regenerators. Air washers and coolers increase horsepower, reduce maintenance.

8. **ONLY 13 CU FT/HP** of building space is required for the G-E gas turbine. A small crew operates entire station at Cornudas.

SMALL, LOW-COST BUILDING



ASSEMBLY of combustion gas turbines for pipeline pumping is carried out in this bay of General Electric's turbine plant at Schenectady, New York. Gas turbines for locomotive and power-generation service are also built on this assembly line.

G-E plant tooled for continuous production of gas turbines

Today, General Electric's turbine plant is producing, testing, and shipping gas turbines on a regular schedule. Assembled units leave the factory ready for easy installation requiring minimum expenditure of time and labor. G-E Application and design engineers, drawing from a fund of gas turbine construction and operational data, help assure top turbine performance on the line.

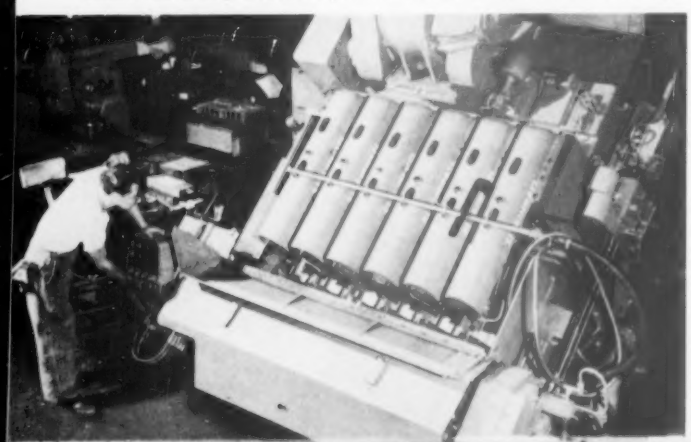
Your nearby G-E Apparatus Sales Representative will tell you more about the G-E gas turbine—America's newest prime mover. General Electric Co., Schenectady 5, N. Y. 661-38

Combustion Gas Turbines for the Petroleum Industry
— backed by 45 years of turbine leadership

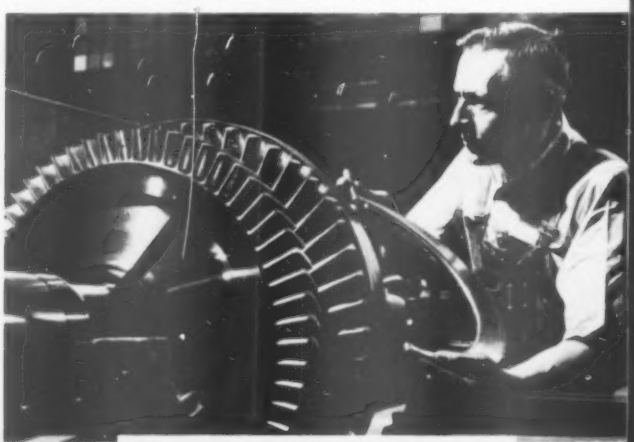
GENERAL ELECTRIC

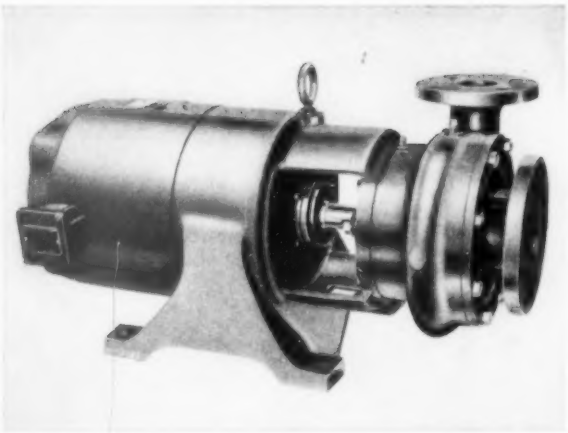
ENGINEERING KNOW-HOW—developed through exhaustive research on gas turbines—can help you with the application of this efficient unit for your pipeline pumping operations.

SPECIALIZED MACHINE TOOLS like this contour milling machine used in making turbine buckets and compressor blades—make the G-E gas turbine plant the most modern in the country.

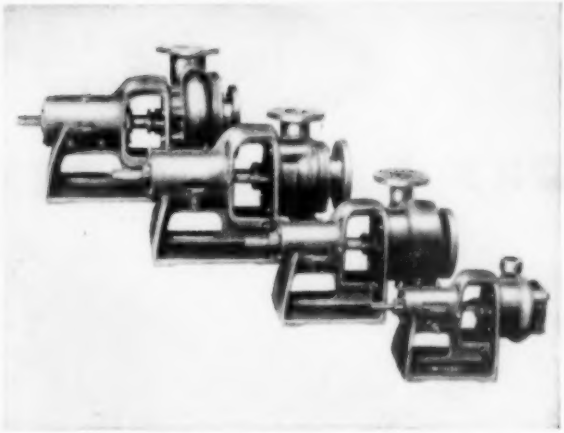


TURBINE CRAFTSMEN apply knowledge gained in years of steam and gas turbine-building experience. Here, a turbine wheel is measured against precise specifications.



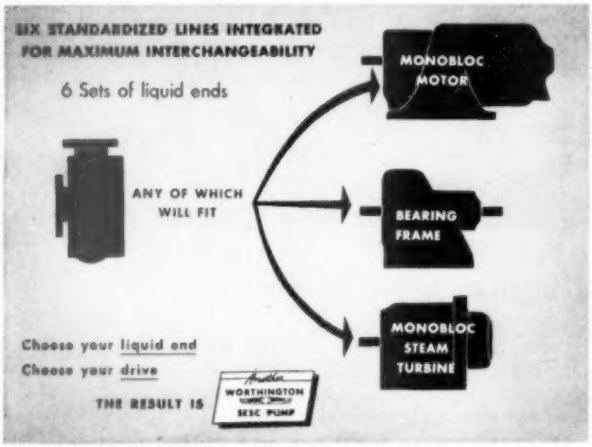


WITH BUILT-IN MOTOR—Well known throughout industry is this compact streamlined Worthington Monobloc centrifugal pump. Worthington SESC standardization makes it possible to interchange any of six sets of liquid ends to the motor housing.



FOR ANY CONVENIENT DRIVE—Frame-mounted units are available in four frame sizes. Like the Monoblocs, they use the same six sets of liquid ends and either conventional packing or a standardized mechanical seal that is readily changed in the field if necessary.

Why Worthington's SESC* pump line means greater availability, broader selection, easier servicing



STANDARDIZATION of *parts, mountings, materials* and *dimensions* virtually eliminates the necessity of slow and expensive custom manufacture to meet special pumping requirements. From 650 parts within its six standardized sets of liquid ends, Worthington can assemble 60,000 *different* standard pumps! C.3.1

Greater availability because the new Worthington pump line will handle more requirements with a *standard*, readily obtainable unit.

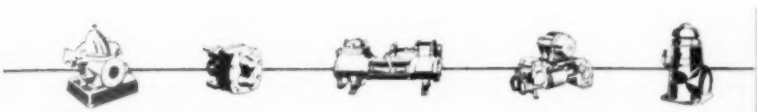
Broader selection because of the complete range of ratings and special design features in the 60,000 different SESC pumps.

Easier servicing because standardized parts mean lower parts-inventory requirements.

This sums up the advantages you can expect when you use Worthington standardized centrifugal pumps. The SESC line is Worthington's latest move towards assuring you the *right* pump for the job.

For more information, contact your local Worthington distributor or write for Bulletin W300 B-4 to Worthington Corporation, Centrifugal Pump Division, Harrison, New Jersey.

*Standardized End Suction Centrifugal

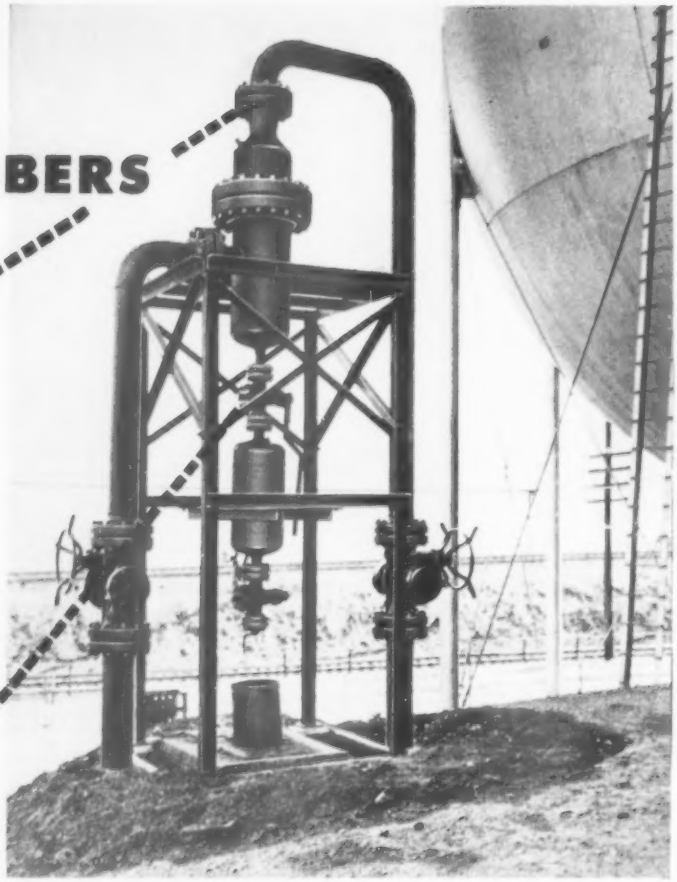


The World's Broadest Line Assures You The Right Pump For Every Job

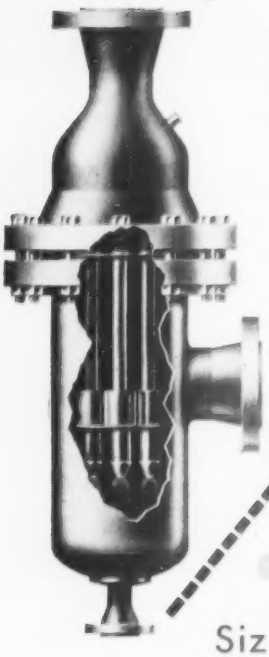
WORTHINGTON
Centrifugal Pumps

AEROTEC

DRY GAS SCRUBBERS



One of five Aerotec installations for Central Hudson Gas and Electric Co., Poughkeepsie, N. Y. Six more units are on order for this company.



Remove dusts, liquids and distillates with *high efficiencies*

Sizes for every well and pipeline need

Collection efficiency on natural gas impurities is extremely high with Aerotec Gas Scrubbers. Proven time after time in tests and day after day in actual service, these units solve one of the oil-gas industry's most difficult precipitating problems. The Aerotec *dry* process thoroughly rids the gas stream of dusts, liquids, and distillates. You are never troubled by carryover of oil or other cleaning mediums, as with conventional types of scrubbers.

Operating on the principle of separation by centrifugal force, Aerotec Scrubbers precipitate foreign materials from the gas by passing it through multiple, small-diameter tubes. In overall design, these units are lightweight, compact, and simplified for easy installation. Available in standard units up to 100,000,000 SCFD, Aerotec Scrubbers can be manifolded to provide for unlimited capacities.

Our representatives, backed by Aerotec's long experience in solving problems of air and gas cleaning, are ready to serve you at any time. Our Catalog 501 also offers you helpful details. Call or write.

Project Engineers **THE THERMIX CORPORATION** Greenwich, Conn.

(Offices in 38 Principal Cities)

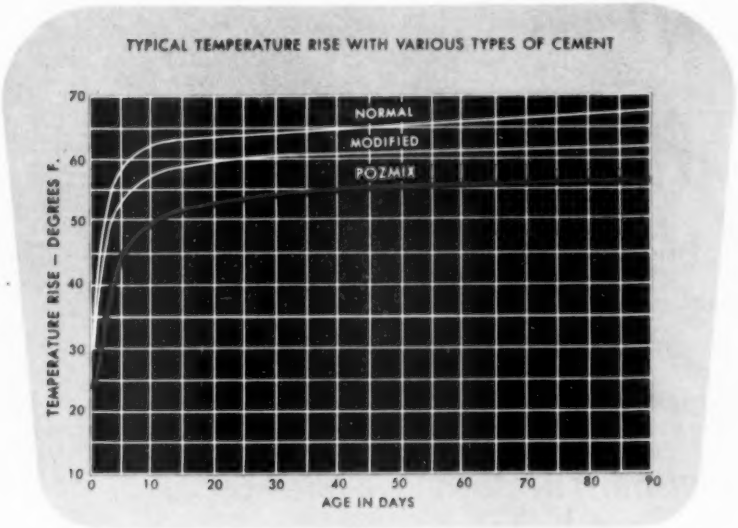
Canadian Affiliates: T. C. CHOWN, LTD., Montreal 25, Quebec; Toronto 5, Ontario

Manufacturers

THE AEROTEC CORPORATION

GREENWICH, CONN.

LESS HYDRATION HEAT MINIMIZES STRESS!



HALLIBURTON'S POZMIX CEMENT

Heat liberated when cement sets, which results in internal stress, is reduced sharply when this revolutionary Halliburton blend is used in cementing of wells. This reduction occurs because Pozmix generates less hydration heat than ordinary portland cements, yet allows for excellent temperature surveys.

Pozmix possesses additional benefits of real value to the operator: lower density and lighter weight, a factor that limits possibility of formation breakdown; superior tensile and compressive strength, and increased resistance to corrosive waters.

This highly effective slurry, a precise blend of pozzolanic materials and portland cement, has another important advantage: *it actually costs less.*

Pozmix is now available in commercial quantities to provide better cementing and longer life for your well. Phone your nearby Halliburton representative for service. Or contact Halliburton, Oil Well Cementing Company, Duncan, Oklahoma.

YEARS AHEAD IN OIL WELL CEMENTING!

HALLIBURTON

in this little bag of beans

42

sizes of economical

UNIBOLT

- Christmas Tree Flow Manifolds
- Positive Chokes
- Cage Nipples
- Tees and Crosses
- Couplings and Blanking Plugs

FLOW-RATED X-BEAN INSERTS UNDER 14/64ths

total of 74 sizes of X-BEANS up to ½ inch!

UNIBOLT Flow Rated X-Beans, for use with UNIBOLT Choke Bodies and Cage Nipples exclusively, are drilled in increments of 5 percent and 10 percent of *well flow* rather than in increments of 1/64-inch. Consequently, the flow of fluid or gas can be positively controlled with a degree of accuracy never before attained. If, for example, a well produces 10 bbls. through a 1/64-inch choke, to increase the choke to the next largest fractionally drilled size, 2/64-inch, would increase the production to approximately 40 bbls. On the other hand, a well that produces 10 bbls. through a size X-35 UNIBOLT X-Bean would produce only 10½ bbls. through the next largest size X-Bean, X-35.5; 11 bbls. through an X-36, and so on.

This accurate control of production is a safeguard against the harmful effect of periodically pulling a well too hard in order to make its allowable.

THORNHILL-CRAVER COMPANY

P. O. BOX 1184 • HOUSTON, TEXAS

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Here's a new catalog you'll surely want. It gives you all the details on Rex Speed Primer Pumps for oil field use. Rex offers a complete line of self-priming centrifugal oil field pumps in capacities ranging from 4,000 gallons per hour to 90,000 gallons per hour. There are gasoline-powered pumps, electric motor driven pumps and pumps without power arranged for belt drive.

You'll find complete specifications, application information, details on construction and operation plus many interesting application photos. You'll learn why—when it comes to oil field pumps—your best buy is Rex. Just mail the coupon.

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Chain Belt Company
4619 W. Greenfield Ave.
Milwaukee 1, Wisconsin

53-315 A

Gentlemen: Please send me Bulletin 53-37 on Rex Speed Primers.

Name.....

Company.....

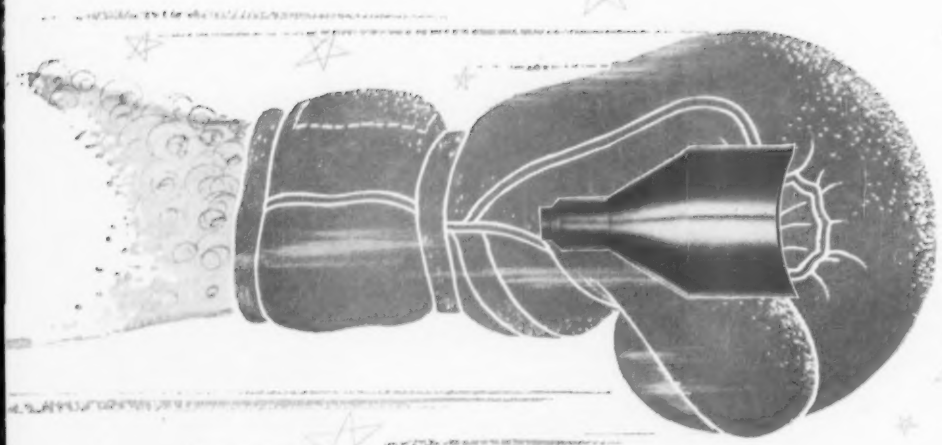
Address.....*Dept.*.....

City.....*State*.....

CHAIN BELT REX COMPANY ®

SPEED PRIMER PUMPS

The "SUNDAY PUNCH" is only the beginning



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Lane-Wells' record of 97% efficiency in more than 192,000 perforating jobs

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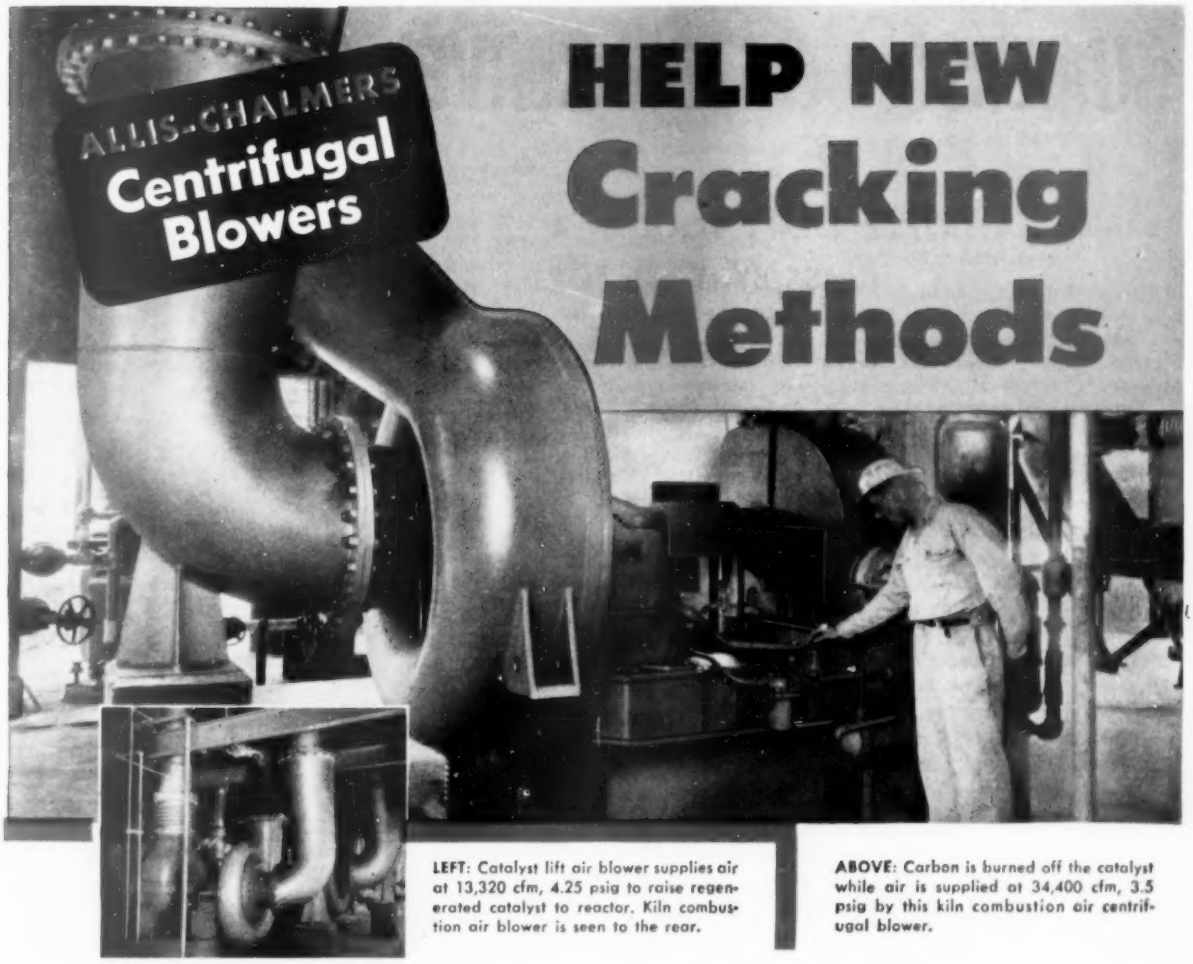

LEFT: Catalyst lift air blower supplies air at 13,320 cfm, 4.25 psig to raise regenerated catalyst to reactor. Kiln combustion air blower is seen to the rear.

ABOVE: Carbon is burned off the catalyst while air is supplied at 34,400 cfm, 3.5 psig by this kiln combustion air centrifugal blower.

AS CRACKING METHODS IMPROVE, more centrifugal blowers are being employed. The Allis-Chalmers single stage blowers seen here are essential to the three new Thermofor Catalytic Cracking units installed by the Magnolia Petroleum Co. at Beaumont, Texas.

A total of six turbine-driven A-C single stage blowers provide kiln combustion and catalyst lift air in the blower room of the new catalytic structure.

The high efficiency impellers are of special totally enclosed, backward flow design. This covered design makes the impellers independent of tolerance variations; the backward flow design gives good pressure, volume and horsepower characteristics.

High strength and long life is assured by all-welded, alloy steel impeller construction and pressure lubricated sleeve and thrust bearings. Cast iron casing increases rigidity and decreases noise level.

For this kind of specialized design . . . or for standard high quality, thoroughly tested air and gas handling equipment . . . call your nearest A-C office or write to Allis-Chalmers, Milwaukee 1, Wis.

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Power, Electrical, Processing Equipment for Petroleum Industry

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GUIBERSON 65 TON SWIVEL

A TRIPLE DUTY TOOL IN A CLASS BY ITSELF FOR

REVERSE CIRCULATION
GAS DRILLING
CONVENTIONAL CIRCULATION

For Reverse Circulation

Guiberson's 65 Ton Swivel gives you triple your money's worth because it does triple duty in the field. Used with Guiberson's famous Full-Floating Wash Pipe, it is without equal for slim hole drilling, work-overs and cleanout work and for drilling in with reverse circulation.

For Gas or Air Drilling

For gas or air drilling, the 65 Ton Swivel with Full-Floating Wash Pipe is gaining rapid popularity for its time and labor saving efficiency. Wash Pipe never needs adjustment and requires no more attention than regular greasing. Packing assembly is fast and easy to replace, goes in without disconnection of gooseneck or hose.

For Conventional Circulation

When used with conventional washpipe and packing, the 65 Ton Swivel does a top-notch job of conventional circulation. But whether you need this "workhorse" for one job or all three, it will give you rugged, dependable service. Buy it with either the Full-Floating Wash Pipe or Conventional — add the other when and as needed — you'll save time and money in the field.

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ESTABLISHED 1919 • DALLAS, TEXAS, U. S. A.

Sold By Leading Oil Field Supply Stores Everywhere

More than a third of a century's experience serving the oil industry.

They Say—

A Cabinet Member on Regulation

"There is plenty of room for improvement . . . in the field of regulation. When regulation departs from its traditional role and encroaches on the field properly allocated to management, it may well slow down the progress and development of the industries being regulated.

"No group has been more unwisely and unfairly treated than the service industries. . . The way the Government has been regulating these service industries reminds me of a gentleman who owned a farm. . .

"Now this owner figured that the way to make money on a milk farm was to watch expenses like a hawk. This he did and complained regularly about expenses and particularly about the feed bill, the largest single item.

"He finally learned—the hard way—that you don't make milk by stinting on the feed, and the same is true in regulation. If we want service from a service industry, a full diet—in terms of income—is clearly to be desired. And the people, if they understand, would want it this way. They don't go around with the balance sheet of the motor companies, the electric companies, the chain stores, etc., so as to be sure to buy the products of the companies that make the least money."

Sinclair Weeks, Secretary of Commerce, addressing the American Iron and Steel Institute, New York.

Attack on Taxes

"Since the taxation of gasoline is a clear-cut example of an overlapping of state and federal functions, it seems safe to assume that the federal motor fuel tax will come under the scrutiny of the proposed new commission. Concerted action for repeal of this tax, therefore, has never seemed more well timed.

"In some quarters, however, there still seems to be a reluctance to throw full support behind this movement urging repeal of the federal gasoline excise."

Tax Economics Bulletin, published by the American Petroleum Industries Committee.

Solving the Oversupply

"To prevent the waste of a resource vital to the state and the nation, Texas statutes require oil production to be geared to market demand. But Texas so far has stood almost alone in giving ground before the advance of oil imports.

"As Mr. (Robert F.) Windfohr put it with a touch of justifiable bitterness, the other oil-producing states—specifically Oklahoma, Louisiana and Kansas—are giving more lip service than actual aid in adjusting the over-all oil supply to the demands of the market. The effort to solve the problem of oversupply likewise has received only lip service from the importers of petroleum.

"What is needed is a show on the part of the importing companies of some of the "industrial statesmanship" for which Governor Shivers recently called. That term is more than a mere catchphrase. Industrial statesmanship means the ability of private enterprise to regulate itself in its own enlightened self-interest and in the interest of the country."

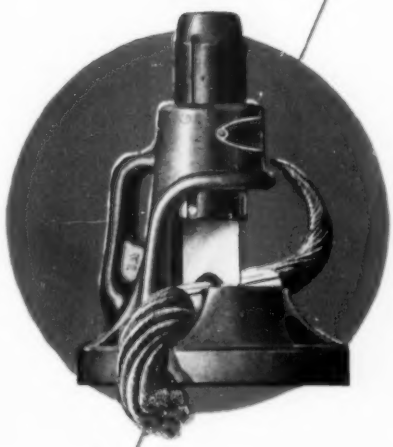
Editorial in the Fort Worth Star-Telegram.

Labor-Management Tragedy

"We must recognize frankly that no matter how earnestly the leaders of industry may seek to do so, they will never succeed in gaining industrial peace until the leadership of labor displays an equal desire to attain it; for

Morse-Starrett
WIRE ROPE CUTTER

CUTS WIRE ROPE



FASTER . . .
Especially designed cutting blade and dies assures fast cutting action . . . The hammer principle eliminates any special skill requirements.

CLEANER . . .
No jagged ends. The wire rope is cut with ends smooth and clean for perfect threading or splicing.

SAFER . . .
The enclosed cutting blade locked in the body of the cutter assures perfect safety.

and it's

PORTABLE . . .
Models for tool kit or stationary operation. With cutting capacities up to: 1 inch, 1-1/16 inch, 1½ inch.

SEE YOUR DEALER OR WRITE DEPT. "M"

Morse-Starrett Products Company
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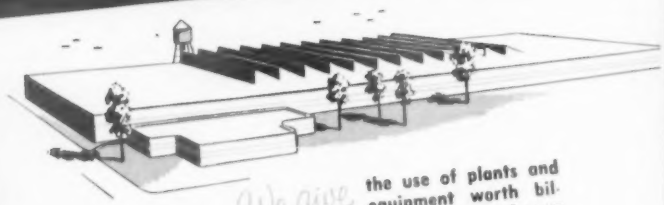
WHAT WE GIVE . . .

We give the management know-how of men in the manufacture-supply-service industry—men who know what it is to work around the clock when a well is at stake; who know what it is to walk hundreds of miles through barren wastes in search for oil formations; who know what it is to work mathematical formulas through the night in the highly technical services; who know what it is to fight for our customers in obtaining supplies when the supply is short, to work night and day and travel by plane and train and car from coast to coast.

These are the men who learned their management know-how by giving their last ounce of brain and brawn in the many emergencies of the oil industry—and who are now heading up the leading manufacture-supply-service companies that measure their sales to the gigantic oil industry in billions of dollars. Because of their hard-bought know-how they serve well a hard-driving, demanding industry.

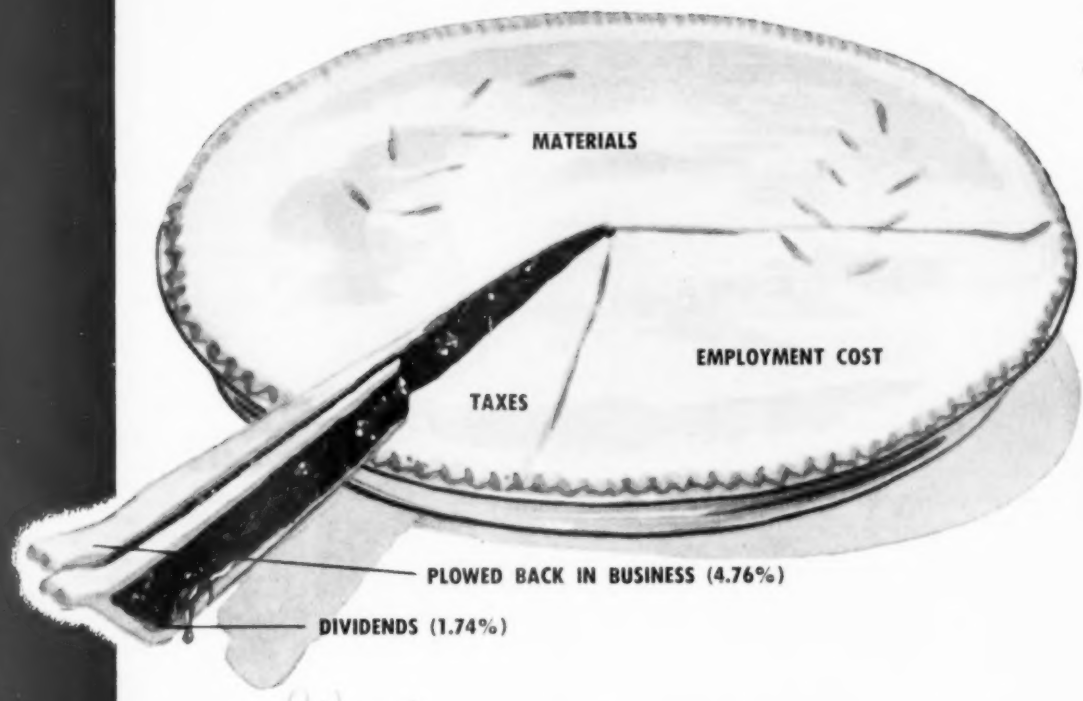
We give the technological know-how of 765 scientists, 1840 development engineers, 445 metallurgists, 855 inspection engineers, 5583 field and service engineers—over 9000 men in all—with highly specialized, technical knowledge, according to the estimates from a recent survey.



We give the use of plants and equipment worth billions of dollars in order to supply our customer, the giant oil industry, with precision tools and equipment, to supply them where he wants them and when he wants them, and to furnish the service of some of the keenest-minded men in the scientific and industrial world.

PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION

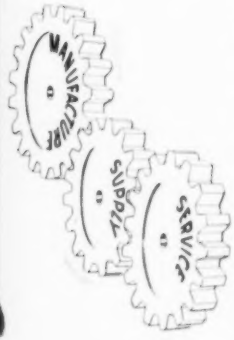
FOR WHAT WE GET



We get

For this service which requires the brains of the smartest management men, scientists and engineers . . . which requires fortitude unequalled in any other industry . . . which requires men who know not what it is to work by the clock . . . for these super requirements necessary to serve well a super industry—we get the small average dividend of 1.74% of the total income dollar—and the average earnings we plow back into the building up of the companies in order to better serve the oil industry is 4.76%.

Our determination to do even better knows no bounds. Our vision for the oil industry knows no horizons. Our faith in the oil industry in which we live and move, and have our business destiny, is so great that we will continue to drive forward undaunted by temporary obstacles or set-backs. We will advance and expand our manufacture - supply - service industry in order to keep ahead of the requirements of one of the world's most dynamic and fastest growing industries — one of the most important industries from the standpoint of the strength and security of our nation — oil.



PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION

industrial peace—if we are to achieve it at all—must be based firmly on mutual confidence, respect and understanding.

"The tragic truth in America today is that industry's capacity to pay could be greatly increased if it were not for strikes and slowdowns and featherbedding work rules which restrict the output of men and machines and limit their earnings accordingly.

"If all these restrictions upon the productive power of labor could be wiped out, once and for all, I firmly believe that many of the workers in many of our industries—using exactly the same tools and machines that are now at their disposal, and without lengthening their hours of work in any way—could substantially increase their present earning power."

Benjamin F. Fairless, chairman of the board, United States Steel Corp., in an address after receiving the Vermilye Medal of Franklin Institute, Philadelphia.

Comment From Japan

"It is difficult to believe that the Iranian authorities have acted with much perspicuity, and we can hardly understand why they could not have discovered some method of making better terms with the Anglo-Iranian Oil Co. instead of proceeding to total expropriation. The allegation that the British tried to wring too much out of the Iranians hardly seems justified. The suspicion is that the decision to expropriate was taken out of pure political intransigence. The 'hate-the-foreigner' attitude of many of Dr. Mossadegh's supporters has so far not led Iran into profitable paths.

"On the wider issue of whether it is desirable that Japan should buy Iranian oil at present, under all circumstances of the case, we think the answer is in the negative. Perhaps the best way of dealing with the matter would be for the Japanese Government to refuse to make foreign exchange available for these transactions until the situation is clarified further as to the ownership of the oil.

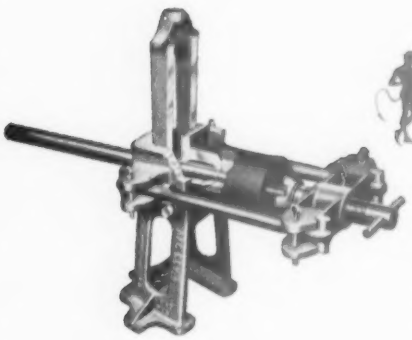
Editorial in the Nippon Times.

RED DEVIL

"DIA-HARD" PISTON RODS

For high pressure abrasive service

RED DEVIL Piston Rods are first choice where drilling conditions are severest because of the extreme hardness of the deep HIGH-CARBON wear resistant "DIA-HARD" case, coupled with tough core properties which give the highest tensile strength against breakage. All rods are hardness tested and precision gauged to maintain a world-wide reputation for quality. Write for Catalog No. P-101.



RED DEVIL PISTON PULLER

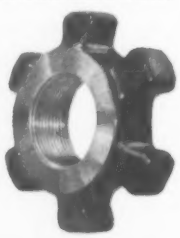
For tapered type rods

The usual practice of removing pistons from rods by blows of a sledge hammer often damages either pistons or rods. A Red Devil piston puller easily and quickly removes badly stuck pistons without injury to either part. All elements are made of finest quality alloy steel, heat-treated for strength and long life. Write for Catalog No. P-106.

RED DEVIL PISTON ROD LOCK NUT

These "Hammer Lug Type" nuts provide a fast and positive means for locking piston rod in crosshead. Made from alloy steel and heat treated, they will last indefinitely. Face of nut is precision machined for full seating surface at right angles to axis of threads to prevent fatigue stresses in rod. Write for Catalog P-102.

Complete information in Composite Catalog or write for price catalogs noted above. Red Devil products are available through your supply store.



OIL WELL MANUFACTURING CORP.

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CALENDAR OF EVENTS

JUNE

16-19 American Welding Society, national spring technical meeting, Shamrock Hotel, Houston.

June 16-
July 2 Intensive Course and Research Conference on Phase Behavior of the Hydrocarbons, University of Michigan, College of Engineering, Ann Arbor.

18-19 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Conrad Hilton Hotel, Chicago.

18-19 Pennsylvania Grade Crude Oil Association, annual meeting, Hotel William Penn, Pittsburgh.

18-20 National Society of Professional Engineers, annual meeting, Sheraton-Beach Hotel, Daytona Beach, Fla.

19-21 Appalachian Geological Society Field Trip, Elkins, W. Va.

24-27 Intermountain Association of Petroleum Geologists, fourth annual field conference, Ben Lomond Hotel, Ogden, Utah.

June 28-
July 2 American Society of Mechanical Engineers, semiannual meeting, Hotel Statler, Los Angeles.

June 28-
July 2 Petroleum Equipment Suppliers Association, annual meeting, Broadmoor Hotel, Colorado Springs, Colo.

June 29-
July 3 American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

JULY

July 30-
Aug. 1 Wyoming Geological Association, eighth annual field conference, University of Wyoming, Laramie.

AUG.

17-19 Society of Automotive Engineers, international West Coast meeting,

Georgia Hotel, Vancouver, B. C., Canada.

18-21 American Institute of Electrical Engineers, Vancouver Hotel, Vancouver, B. C.

24-26 Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, Va.

Aug. 31-Sept. 1 Interstate Oil Compact Commission, Northern Hotel, Billings, Mont.

SEPT.

6-11 American Chemical Society, national meeting, Conrad Hilton Hotel, Chicago.

9-11 Pacific Coast Gas Association, San Francisco.

11-12 Association of Desk and Derrick Clubs of North America, annual meeting, Cosmopolitan Hotel, Denver.

13-16 American Institute of Chemical Engineers, Fairmont and Mark Hopkins hotels, San Francisco.

15-16 American Petroleum Institute, executive committee, Greenbrier Hotel, White Sulphur Springs, W. Va.

16-18 National Petroleum Association, annual meeting, Hotel Traymore, Atlantic City, N. J.

21-25 Instrument Society of America, national instrument conference and exhibit, Sherman and Morrison hotels, Chicago.

24-25 Western Petroleum Refiners Association, regional meeting, Henning Hotel, Casper, Wyo.

27-30 American Society of Mechanical Engineers, annual conference, petroleum division, Rice Hotel, Houston.

28-29 Independent Natural Gas Association of America, Shamrock Hotel, Houston.

Sept. 30-Oct. 2. American Association of Petroleum Geologists, Mid-Continent regional meeting, Masonic Building, Wichita.

OCT.

1- 2 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.

6- 7 Texas Mid-Continent Oil and Gas Association Rice Hotel, Houston.

7- 9 National Association of Corrosion Engineers, south central region, Mayo Hotel, Tulsa.

8- 9 California Natural Gasoline Association, annual fall meeting, Ambassador Hotel, Los Angeles.

11-17 Oil Progress Week.

19-20 Independent Petroleum Association of America, annual meeting, Texas Hotel, Fort Worth.

26-29 American Gas Association, annual conference, Kiel Auditorium, St. Louis.

29-31 Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver.

NOV.

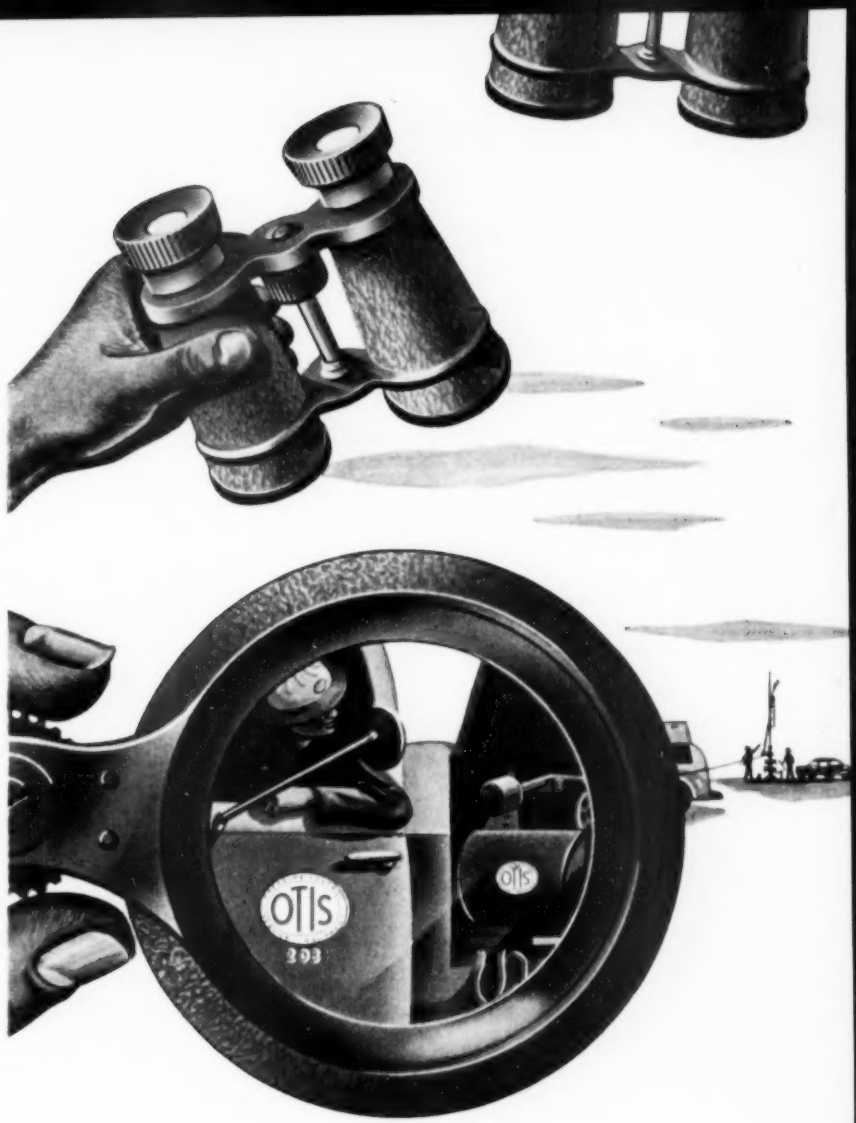
3- 4 Society of Automotive Engineers, national diesel-engine meeting, Conrad Hilton Hotel, Chicago.

5- 6 Society of Automotive Engineers, national fuels and lubricants meeting, Conrad Hilton Hotel, Chicago.

5- 6 American Association of Petroleum Geologists, Pacific section annual meeting, Hotel Biltmore, Los Angeles.

9-12 American Petroleum Institute, annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

21 National Gasoline Association of America, regional meeting, Herring Hotel, Amarillo, Tex.



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- Running bottom-hole pressure bombs; fishing; hydrostatic bailing
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- Installing Otis Two-Zone Pumps and Cross-Over Equipment
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General offices and plant: 6612 Denton Drive, P. O. Box 7206, Dallas, Texas; branches in Houston, Corpus Christi, Victoria, Longview, Falfurrias, Odessa, Beaumont, New Iberia, Houma, Shreveport, Hobbs, Brookhaven, Oklahoma City, Elk City, and Pauls Valley. Authorized export dealer: Otis Pressure Control Export, Inc., 8035 102nd St., Edmonton, Alberta, Canada.

OTIS PRESSURE CONTROL, Inc.

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YOUR PERPETUAL EXPOSITION

OF THE LATEST IN OIL FIELD EQUIPMENT

There is no waving of banners or blaring of trumpets to herald the day-to-day operations of the Supply Industry.

Quietly and undramatically, this important segment of the Petro-Chemical Industry goes about its business of bringing to your doorstep the latest and best of everything you need—or might need.

Often said, but never trite—a chain is no stronger than its weakest link. You add to your own strength when you purchase all of your requirements ". . . Through Your Supply Store."

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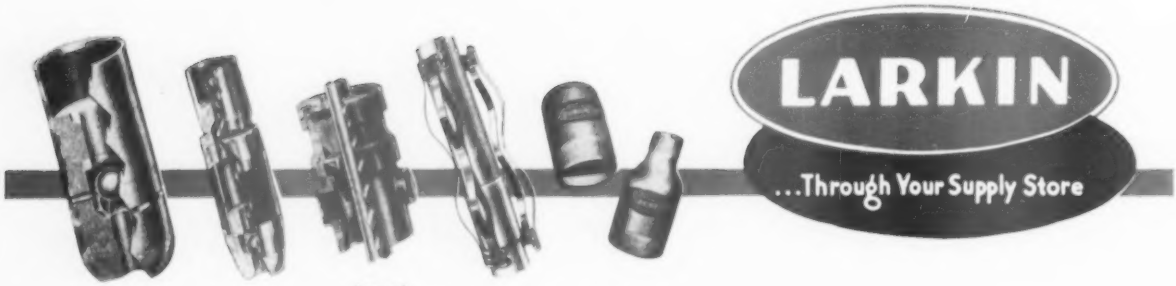

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THE OIL AND GAS

JOURNAL

TULSA, OKLAHOMA

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JOURNALLY Speaking

Slow Boat to Africa

OCCASIONAL remarks in this department about the delivery service which our Post Office Department affords the Big Yellow Book have elicited a number of comments from readers, for the most part quite complimentary of their local delivery service.

Now we have a report on the international postal service from a faithful reader in Algeria, North Africa. Being a meticulous individual, he kept a score card of the date of arrival of his copy every week for the past 6 months. This showed that he received it all the way from 12 to 64 days after date of publication; the median was 19 days and the average 21 days.

That's not bad, considering the fact that the book had to get through the intricacies of the United States Post Office Department, the transatlantic steamship system, and the *Bureau de Post en France*. But still we feel sorry for our Algerian reader because he is always about 3 weeks behind on the news—a serious handicap in such a fast-moving industry. So you American readers who gripe because you sometimes don't get Monday's edition of our favorite oil publication until Tuesday or even Wednesday should realize that you still have a big advantage over your foreign competitors. We might even go so far as to suggest that this may be the reason why the American oil industry manages to keep out in front of all others.

Famous Firsts

LAST week a group of old-time California oil men, organized as the Petroleum Production Pioneers, journeyed up to Pico Canyon, on the outskirts of Los Angeles, and placed a commemorative plaque on a dilapidated wooden derrick proclaiming the No. 4 Pico as the first commercial oil well in California.

This probably started a lot of arguments such as usually rage around the selection of anything as the "first in history." For example, a lot of people contest the Drake well's claim to being the start of the oil industry. They can cite examples of crude oil being used prior to 1859. But if you try to trace the knowledge and use of petroleum to the dawn of history you get lost in the myths of the cave men, who didn't keep accurate scout reports, and it is pretty well authenticated that the Drake well near Titusville, Pa., was the first commercially successful well ever drilled for oil.

So with the old 4 Pico. The California Indians and their aboriginal predecessors used oil from seeps and tar pits, and during the Civil War period a number of wells were drilled for oil in the state. One, up north of San Francisco, actually produced a little oil which was brought out in cans on the backs of pack mules, but it was not a commercial success. The famous well's name clearly shows that it was the fourth well drilled in Pico Canyon. The first three were dry, but when, in 1875, No. 4 came in for 30 bbl. per day, the West Coast oil industry was born. And the 4 Pico was drilled by an outfit which now bears the name of Standard Oil Co. of California, which, almost everyone will agree, may be classed as a commercially successful enterprise.

Ominous Inference

LOOK for some extra special efforts on the part of geologists for Socony-Vacuum and affiliates, perhaps even a phenomenal wildcat success ratio. The company's employe magazine contains an article by a former Russian geologist who reports that few Soviet geologists drill more than one dry hole. The Communist geologist who fails to find oil is pretty certain to be rewarded with a one-way ticket to Siberia.

Socony-Vacuum didn't say why it was calling this to the attention of its exploration department, but the moral seems plain to us. A hint to the wise is sufficient.

Henry D. Ralph

no drilling string should be without a...

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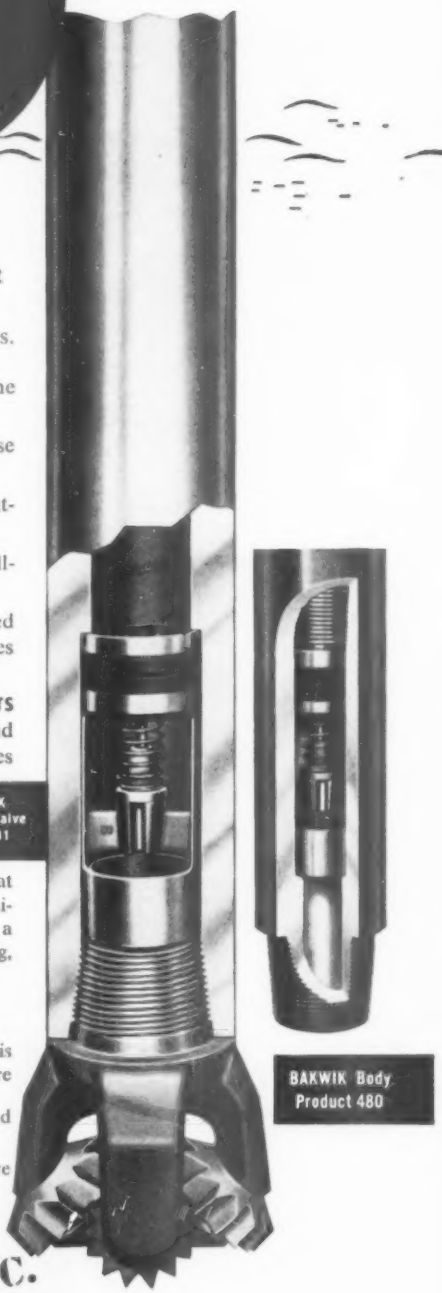

Baker BAKWIK Drill Pipe Float Valve Product No. 481

BAKWIK Body Product 480

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A majority of operators install the Baker BAKWIK Drill Pipe Float in a valve chamber in the drill collar (see large illustration) where it is held in position by the pin on the drilling bit. Or the valve assembly can be positioned in a BAKWIK Body (Product No. 480) installed at any desired point in the drilling string, and held in position by the tool joint pin.

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BAKER OIL TOOLS, INC.

HOUSTON • LOS ANGELES • NEW YORK

Correlative rights get set down a peg

THE decision of the Texas Supreme Court on the Spraberry shutdown may turn out to be a landmark in conservation law, although its immediate effect is to set aside the attempt of the Texas Railroad Commission to stop the tremendous waste of gas in that huge field.

The court said there is a limit to the commission's power to shut in nonwasteful production of oil and gas for the purpose of protecting the correlative rights of producers whose operations are closed down because they are wasteful.

This limit was not spelled out by the court. If the commission can write a new administrative order which accomplishes its purpose without again transgressing the court's concept of its authority, it and the regulatory bodies of other states may have a new weapon in the cause of conservation.

This weapon is the power to reward nonwasteful producers and to penalize those who are laggard in conservation practices by depriving them of some of their heretofore sacred correlative rights.

IF things turn out this way it will be an ironical twist to the doctrine of correlative rights, a doctrine which has been a cornerstone of conservation law. Under it, operators have been forced to stop many wasteful practices to prevent them from injuring their neighbors, but, at times, this has held back conservation-minded operators by reducing all to the lowest common denominator of the most wasteful. Now the shoe is on the other foot.

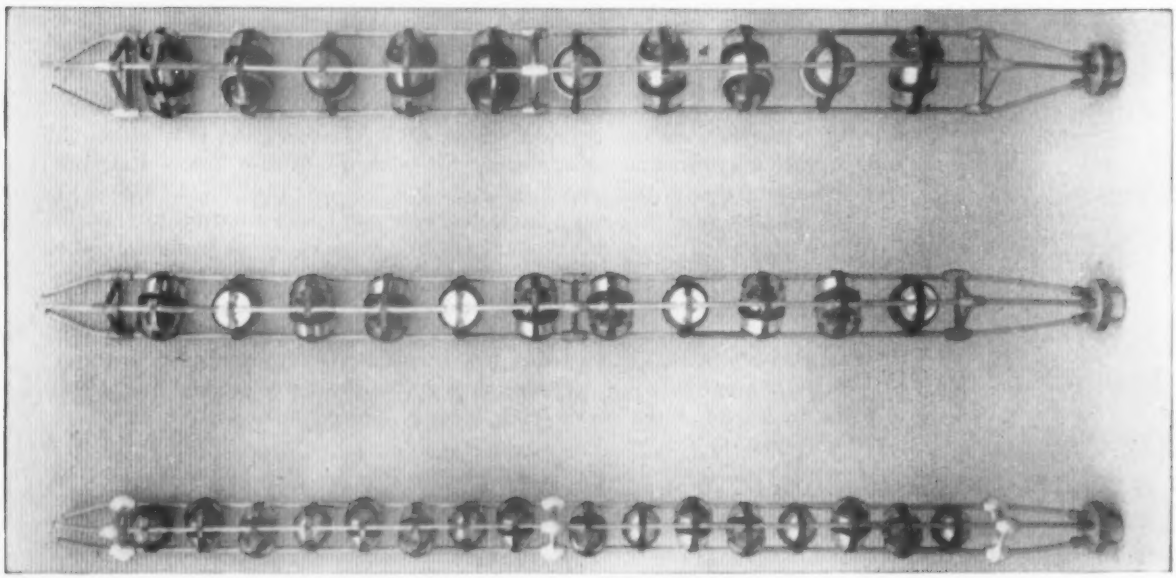
In the Spraberry case the Texas court said the commission has power to shut down oil wells flaring gas; but that it cannot shut down—completely and indefinitely—wells which are conserving their gas through connections with pipe lines even though their continued operation will drain adjacent shutdown leases. In other words, the right to be protected against undue drainage cannot be used indiscriminately to prevent careful and economic operations by a neighbor.

IF this interpretation prevails it will put a premium on rapid adoption of conservation practices and installation of facilities for gas utilization. It permits sections of a field to get preferred treatment instead of holding all to the pace of the slowest. This adds an element of competition through a reward for nonwasteful operation.

This same court had earlier asserted that protection of correlative rights is secondary to prevention of waste in oil and gas regulation. The Spraberry decision, at least on first reading, appears to put authority behind that principle.

DOWELL GLASS GUN PERFORATING SUCCEEDED WHERE OTHER METHODS FAILED

Gas Well Production Increased from Show To 3½ Million Cubic Feet Per Day— Exceeding Requirements for Gas Drive Project



Dowell Glass Guns can be assembled to fit practically any well diameter that may be encountered. Three different sizes of charges permit gun construction as small as 3⅝ inches and up to 3 feet or more in diameter. Special "angle" guns shoot 30 degrees off the horizontal to penetrate shale streaks and give better formation drainage.

Here is an example of the effectiveness of Dowell's Glass Gun . . . producing results after regular bullet and steel gun jets had failed.

This well was completed as an oil well but was found to be non-profitable. It was then plugged back to a known gas zone. Several unsuccessful attempts were made to recomplete the well by perforating the 23-lb. 7-inch OD casing and the cement. Both bullets and steel gun jets, at 6 shots per foot, gave only a show of gas.

Dowell was then called to perforate with the Glass Gun. After 70 GG7 shots, at only 2½ shots per foot, the well was producing at a rate of 3½ million cubic feet per day. The remainder of the job was called off because the gas drive project required only 2 million cubic feet of gas per day.

In addition to greater penetration, Glass Guns give larger perforation hole size. They are also of value in open hole shooting because they are self-destroying and leave a junk-free hole.

Glass Guns are run on Dowell Electric Pilot equipment engineered for accurate sub-surface measuring.

If you would like to know more about this exclusive, horizontal-firing Glass Gun, the Angle-Jet Gun, the Mono-Directional Glass Gun, or any other Dowell oil field services, make it a point to contact your nearest Dowell office. Or write directly to Tulsa, Dept. B 11-1

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THIS WEEK

COURTS.—Texas Supreme Court kicks out Railroad Commission order shutting down Spraberry Trend field. . . . Says commission may not shut down wells not wasting gas merely to protect correlative rights of flaring operators. . . . New order closing wells without gas outlets expected. . . . ¶Appeal of Texas gas-gathering tax to U. S. Supreme Court expected during court's summer vacation. . . . Action would mean delay of decision until at least October. . . . ¶Majors accused of overcharging Government on Marshall Plan oil shipments file answers in New York federal court. . . . Companies say Government lost no money, there was no overcharge, that federal agencies knew continually prices charged and how they were arrived at. . . .

INTERNATIONAL.—Northern Italy's Po Valley, considered by the industry to be one of the most attractive geological prospects in Europe, is set aside by Italian Government as exclusive operating territory for newly formed oil agency. . . . ¶Biggest tanker to lift nationalized Iranian oil so far, the Japanese vessel Nissyo Maru, arrives at Abadan to take on its second cargo. . . . Japanese Government taking steps to stop future shipments by cutting off future currency allocations for Iranian oil and announcing that it will block any barter deals by its citizens. . . . ¶Standard-Vacuum reveals it will complete its new 25,000-bbl.-daily refinery at Bombay, India, 6 months ahead of original schedule. . . .

LOTS MORE OF THIS is expected when the question of state vs. federal administration of submerged oil lands beyond the historic boundaries of the states is finally resolved in Congress. (See "National Affairs" in this week's news section). This vessel is the Lanciscot I, one of a sizable fleet carrying on seismic exploration in the Gulf of Mexico.

TRENDS.—Stocks of the four major products increased 7,861,000 bbl. for week ended June 6, the largest weekly increase since the end of the war. . . . Districts 1 and 3 accounted for 80 per cent of the gain. . . . Distillate stocks were up 5,969,000 bbl. . . . Gasoline stocks increased 566,000 bbl. in District 1 and 742,000 bbl. in District 3 but were down 1,023,000 bbl. in District 2. . . .

ACTIVITY.—Production of crude and lease condensate averaged 6,387,525 bbl. daily for week ended June 6, up 43,675 bbl. daily. . . . ¶Total well completions were off 57 wells to 884. . . . Wildcat completions for the week totaled 195 compared with 236 for previous week and 185 for same week last year. . . . ¶Rotary rigs operating in United States increased 36 rigs during week ended June 8 to 2,621. . . .

PIPE LINES.—Sinclair Pipe Line agrees to sell old, multiple main-line crude system for salvage. . . . Line, now replaced by 22-24-in. line, expected to yield 170,000 tons of steel in 3-year removal project which is one of biggest ever undertaken. . . . ¶Northern Natural lets contracts for addition of 50,560 hp. in nine compressor stations, boosting capacity of its system to 1,007,000,000 cu. ft. daily by end of this year. . . . ¶Hearings open in Canada on applications of four companies seeking to build a line to deliver Alberta gas to eastern markets. . . .

TIDELANDS.—Coastal states making last-ditch fight to obtain a share in the revenue and a voice in the management of development operations in the Continental Shelf as Senate acts on legislation setting up machinery for federal operation of submerged-lands resources. . . . Chances that they will succeed considered dim. . . .

REFINING.—PAD estimates that demand through the quarter now ending will be about 937,000 bbl. daily less than during the first quarter—meaning that the industry is now suffering from the heaviest seasonal decline in product demand in its history throughout the country east of California. . . . Principal reason for this, agency says, is the rapid rise in the use of oil for space heating since the end of World War II. . . . ¶Pan-Am Southern completes expansion of Destrehan, La., refinery, boosting capacity from the former 8,000 bbl. daily to a new high of 30,000 bbl. daily. . . . New cracker and fluid hydroformer are the first units of their kind to go on stream in the U. S. . . .

CANADA'S PETROCHEMICAL PLANTS are centered mainly in three distinct areas: Alberta, where the nation's hydrocarbon sources are located; Sarnia, Ont., an oil-refining center based principally on Canadian crude and located on the St. Clair River between Lakes Huron and Erie; and Montreal, Que., the nation's principal refining center, based on imported crudes. The bars show the relative totals of plant investment for petrochemical facilities in operation or under construction. Numbers show location of plants listed in the survey.

Petrochemical Boom in Canada

Plant capacity will double this year, but future growth will be limited by small market, remoteness of basics

George Weber

THIS will be a big year for petrochemicals in Canada. Although the industry dates back to the early war years it has generally lagged behind its United States counterpart. In 1953, however, production will more than double.

Prior to this year, about $93 million was invested in operating petrochemical facilities. Due for completion this year are 14 plants costing an estimated $112 million. Three other plants, now under construction and scheduled for completion in 1954, will raise total investment to about $216 million sometime next year.

New plant capacity now operating or building will turn out a total of 34 specific chemicals based on petroleum and natural gas, plus numerous classes of products such as synthetic rubbers, furnace blacks, explosives, lubricating-oil additives, and detergents derived from petroleum basics and intermediates. These do not include the seven light paraffins, olefins, and diolefins supplied to the industry by oil refineries and gas producers.

At the completion of the current building program, Canada will produce five alcohols, four aldehydes, six aromatics, three glycols, and two ketones, plus numerous oxygenated and chlorinated intermediates. As new facilities come on stream it appears that the nation will be self-sufficient in many of them, and an excess of capacity for producing such chemicals as acetone, formaldehyde, ethylene glycol and pentaerythritol, may exist.

Limits to expansion . . . While Canada appears to be in the initial stages of a sizable petrochemical industry, there are limits to which it is likely to expand. Many basic and intermediate chemicals which have been hard to get from the United States are now in plentiful supply in this country, and the relatively low tariffs imposed by Canada will probably preclude successful internal competition with mass-produced chemicals from south of the border.

By comparison with the United States, the domestic Canadian market for chemicals is small, and even the projection of a comparable per capita consumption level indicates that some chemicals may not economically be produced in Canada. The head start gained in the United States, with more economic large-scale operations designed to provide domestic and export demands may well offset what tariff advantages Canadian producers may have.

There is some talk of raising the tariff walls to protect and foster more national production of chemicals. One example was the recent increase in duty on ethylene glycol for antifreeze. Canada, however, is essentially a free-trade country, and it is doubted in some circles whether tariffs on this class of chemicals will be raised substantially.

Chemical exports to the United States must buck a stiff tariff wall which, on the whole, is much higher than that imposed by the Canadian government. This stands in the way of any substantial growth in the industry located in the remote western provinces, whose nearest mass markets are in the United States Middle West. There is the possibility that concessions made to obtain Canadian gas to the Pacific Northwest may include reductions in tariffs imposed by the United States on products from petroleum. Exports to many other countries are hampered by the hard-

ness of Canada's currency and the difficulty in converting income to hard Canadian dollars.

Transportation problem . . . Transportation costs loom important in Canada. With the exception of refinery gas available in Ontario and Quebec, the nation's sources of basic petrochemicals lie in the western provinces, remote from her mass consumption centers in the East. Hence, the development of a petrochemical industry located at the source of supply has definite limits. Alberta can never become the Canadian equivalent of the Gulf Coast, which enjoys much cheaper access to the mass markets of the East.

A recent trend noted in the United States may aid the Canadian industry, however. In this country numerous petrochemical operations supplied by long-distance pipe lines are being located nearer to the market. Canadian crude is now economically available in Ontario. It is quite probable that within the next few years natural gas from western Canada will be moving into Ontario and Quebec. Although this gas will in all probability command a high price, it is likely that the stripping of basic hydrocarbons and their conversion to chemicals may become economic in the East. Meanwhile, western Canada offers a prime prospect for the synthesis of agricultural chemicals. The dual advantage of proximity to both source materials and markets should promote the manufacture of synthetic fertilizers in Alberta, Saskatchewan and Manitoba.

Plant and survey . . . A total of 23 plants engaged in various phases of petrochemical manufacture are now in operation or under construction in Canada. Their total cost is estimated to exceed $216 million.

This total does not include investment in chemical facilities based on other than petroleum and natural-gas sources, nor does it include the overall cost of oil refining and natural-gas processing plants which provide the basic materials. It includes only those facilities specifically installed to separate, purify or convert petrochemicals in refineries. The list does not include many plants which manufacture finished products based in part on petrochemicals.

Plant descriptions . . . Following is a review of Canada's petrochemical industry based on plants either in operation or under construction at this time. Numbers refer to location on map.

. . . 1.—Bakelite (Canada) Ltd., Belleville, Ont. This affiliate of Union Carbide & Carbon Corp. commenced operation this spring. The plant has a capacity for producing about 30 million pound per year of formaldehyde from imported petroleum - derived methanol. About half the production is slated for conversion to phenolic formaldehyde resins and urea formaldehyde products.

. . . 2. — British American Oil Co., Ltd., Montreal, Que. A cumene unit located at the company's 45,000-bbl. per day refinery alkylates benzene and light hydrocarbons to produce the isopropyl benzene. Benzene comes from Shawinigan Chemicals, Ltd., and the product is delivered to an adjacent plant owned by the two companies for oxidation to phenol and acetone. The cumene plant has an estimated capacity for 16½ million pounds of product per year. Production began in February.

. . . 3.—B. A. Shawinigan, Ltd., Montreal, Que. This $4,000,000 plant, referred to above, went into initial production in May. It employs a new oxidation process licensed by Hercules Powder Co. of Wilmington, Del., and Distillers Corp., of Edinburgh, Scotland. Plant capacity will permit production of 13 million pounds of phenol and 8 million pounds of of acetone annually. Byproducts include acetophenone, mesityl oxide, and alpha-methyl styrene.

. . . 4. — Cabot Carbon of Canada, Ltd., Sarnia, Ont. This $3,000,000 plant started operation this spring, will produce from 35 to 50 million pounds of furnace black annually from liquid petroleum fractions derived from local refineries in the Sarnia area.

. . . 5.—Canadian Chemical Co., Edmonton, Alta. This subsidiary of Celanese Corp. of America is building the largest single petrochemical plant in Canada. Estimated to cost $54 million, the new complex of several synthesis units will begin going on stream some time this month. Feed stocks consist of propane and butane, purchased from the nearby refineries of Imperial Oil Ltd., and McColl-Frontenac Oil Co., Ltd. A wide range of oxygenated chemicals will be produced by processes developed in U. S. plants and laboratories of the parent Celanese Corp. These include the first Canadian production from petroleum, of pentaerythritol, methanol, propylene glycol, dipropylene glycol, n-propanol, and n-propanol acetate. Other chemicals will include acetic acid, acetone, acetaldehyde, formaldehyde, paraformaldehyde, n-butanol, methalyl, propionaldehyde and i-butanol. Cellulose acetate will constitute a major end product of the new plant.

. . . 6. — Canadian Gulf Oil Co., Pincher Creek, Alta.—A proposed $2.5 million project to recover 150,000 tons of elemental sulfur per year from H_2S produced with natural gas. This project is presently in abeyance pending the possibility of a natural gas outlet from the Pincher Creek field, and is not included in the over-all survey of petrochemical plants in operation or building.

. . . 7. — Canadian Industries, Ltd., Edmonton, Alta. Due for completion late this year is a $13 million plant with a capacity for producing 12 million pounds of polyethylene per year from natural gas. It is estimated that capacity operation will meet or exceed Canadian demand for this versatile plastic.

. . . 8. — Canadian Industries, Ltd., Maitland, Ont. Petroleum-derived cyclohexane will be converted in this new plant to produce two nylon intermediates: adipic acid and hexamethylene diamine. The plant is due for initial production late this year. Initially it will process imported base stock, but may convert at an early date to domestically produced cyclohexane.

. . . 9. — Canadian Industries, Ltd., Calgary, Alta. A new $4.5 million explosive plant based on ammonia produced from natural gas is now under construction.

. . . 10. — Canadian Oil Co., Ltd., Sarnia, Ont. A fraction of the butylene stream produced in this new 20,000-bbl per day refinery is being sold to Polymer Corp. for conversion to petrochemicals at Sarnia.

. . . 11. — Consolidated Mining & Smelting Co. of Canada, Ltd., Calgary, Alta. For about 10 years this company has been consuming about 10,000 M.c.f. of natural gas per day to produce annually about 90,000 tons of ammonia, part of which is converted to ammonium nitrate for export to the United States.

. . . 12.—Dominion Tar & Chemical, Ltd., Montreal, Que. This newly completed plant, costing an estimated $10 million, has has a capacity for producing 30 million pounds of ethylene glycol per year from refinery gases. Ethylene oxide for synthetic detergent manufacture is also produced and ethylene dichloride is a future possibility.

. . . 13.—Dow Chemical Co. of Canada, Ltd., Sarnia, Ont. Following an agreement signed with Polymer Corp. shortly after World War II, this plant was built to produce polystyrene from styrene purchased from Polymer. Since then the plant has been expanded and petrochemicals account for only part of the total chemical production. The Sarnia plant can make 50 million pounds of ethylene glycol per year, together with various solvents and styrene molding powders. A new styrene monomer plant went on stream in May of this year, with a capacity for 24 million pounds per year. Current expansion also includes new facilities for

synthesizing methyl and methylene chloride, ethylene and polystyrene. Ethylene, formerly purchased from Polymer, was first made in the Dow plant in 1952, and further capacity is being added.

... 14.—Lubrizol of Canada, Ltd., Niagara Falls, Ont. This small-scale operation, paralleling that of the parent United States company, comprises the synthesis of lubricating-oil additives from petroleum fractions.

... 15.—Monsanto Canada, Ltd., Montreal, Que. Polystyrene and monomeric styrene, based on feed stocks to be obtained from Polymer Corp., will be produced in this plant, now under construction.

... 16.—Polymer Corp., Sarnia, Ont. This government-owned company was formed in 1941 to produce synthetic rubber. Originally all base stocks in the form of light hydrocarbons were obtained from Imperial's nearby refinery. Now, the plant is supplied also by Sun Oil Co.'s Toledo, Ohio, refinery and Canadian Oil Co.'s Sarnia refinery. When Sun completes a new refinery at Sarnia later this year, it will undertake the supply now coming from Toledo.

In addition to making Buna S, Buna N, and Butyl types of synthetic rubber plus high-styrene rubbers, latices, and cold rubber, Polymer also produces ethylene, butane, isobutane and styrene for Dow and Monsanto. Some toluene is made as a byproduct of styrene synthesis. Total plant investment exceeds $65 million.

... 17.—Royalite Oil Co., Turner Valley, Alta. This $375,000 plant completed in 1952 recovers an average of 30 tons per day of elemental sulfur from hydrogen sulfide separated from natural gas in the company's field-processing facilities in Turner Valley field.

... 18.—Shell Oil Co. of Canada, Ltd., Jumping Pound, Alta. This sulfur-recovery plant, similar in operation to Royalite's, cost $500,000 and has a capacity of 30 tons of sulfur per day.

... 19.—Shell Oil Co. of Canada, Ltd., Montreal, Que. Completed 2 months ago, this $3.5 million plant located at Shell's 38,000-bbl. per day refinery is capable of producing 12 million pounds of isopropyl alcohol and 8 million pounds of acetone per year from refinery gas.

... 20.—Sherritt-Gordon Mines, Ltd., Fort Saskatchewan, Alta. Under construction is a synthetic nitrogen plant which will convert local natural gas to ammonia. The ammonia is consumed at the same plant in the leaching of metal concentrates. A byproduct of the metal-refining operation will be 70,000 tons of ammonium sulfate per year.

... 21.—St. Maurice Chemicals, Ltd., Varennes, Que. This company, jointly owned by Shawinigan and Heyden Chemical Corp., converts petroleum-derived basics to 30 million pounds of formaldehyde and 2 to 3 million pounds of pentaerythritol per year. It cost an estimated $3 million.

... 22.—Vosco Industrial Chemical Products, Ltd., Montreal, Que. Dodecyl benzene and higher alcohols are converted to synthetic detergents in this new, small plant.

... 23.—Imperial Oil, Ltd., Sarnia. Refinery gases from this expanded 57,000-bbl. per day refinery are processed for separation of methane, ethane, ethylene, propane, propylene, and butylene for further conversion by Polymer Corp. and others in Sarnia.

SOUTHWEST

Spraberry Order Void

Texas' top court holds that nonflaring operations in big field can't be shut in on grounds of correlative rights

AUSTIN.—The Texas Supreme Court has held void the order of the Texas Railroad Commission shutting down Spraberry field.

It did so primarily because the order applied equally to wells which were not wasting gas and to those which were flaring gas.

Asst. Atty. Gen. C. K. Richards, who defended the order for the commission, said that Spraberry wells would not be reopened until the formal order is entered by the court and after a ruling on a motion for rehearing.

The court allowed 15 days, or until June 25, for the commission to file a motion for rehearing, and during this time the shutdown order will remain in effect. If the commission files such a motion within that time, then the status quo will be maintained until the court rules on that motion. Richards immediately began conferences with the commissioners as to the next step.

Attorneys here were of the opinion that the court left the way open for the commission to write a new Spraberry order shutting in flaring wells and letting nonflaring wells produce as much oil as possible within their allowables, provided all gas produced is processed in stripping plants and then finds its way into the fuel market through pipe-line connections.

It was generally anticipated that such an order might be issued by the commission before June 25, possibly immediately after the state-wide allowable hearing June 17.

The 500,000-acre Spraberry field was ordered shut in April 1 because of excessive gas flaring, but the order was immediately attacked in courts by operators of wells which were connected with natural-gasoline plants and gas-transmission lines, and hence not wasting gas. As soon as these operators obtained temporary restraining orders, other suits were brought by operators of flaring wells on the ground that partial operation of the field would drain their gas and oil and injure their correlative rights.

The case reached the Texas Supreme Court on direct appeal from the 126th District Court in Austin which had upheld the commission's order but granted exceptions permitting the operations of wells not wasting gas. A consolidated argument was held on five separate suits brought by Rowan Oil Co., Arthur Harvey, Plymouth Oil Co., Republic Natural Gas Co., and Blackwood & Nichols.

Nonflarers supported . . . The Supreme Court held that the order must stand or fall in its entirety. It reversed the trial court's decision and declared the entire order invalid because it required the closing of nonwasteful operations.

In an opinion written by Associate Justice Will Wilson and handed down June 10, the Supreme Court pointed out that there is a conflict between two policies in the state's conservation statutes—prevention of waste of gas and protection of correlative rights of operators.

The court held that the commission may not shut down nonwasteful operations in order to protect the correlative rights of operators who are wasting gas and whose properties might be drained if they are shut down while adjacent, nonwasteful wells are allowed to operate.

New order suggested . . . This ruling, plus the court's suggestion that the commission attempt a new solution to the problem, may open the way for the commission to write a new order which will put less stress on protection of correlative rights and thus shut down parts of the field while permitting some operation in other parts.

In its decision the Supreme Court said, in part:

"The order under attack is an attempt by the Railroad Commission to put into effect these two public policies. The controversy arises because there are not as yet enough facilities to use and market all the casing-head gas of that (the Spraberry trend area) field, but some of it only . . .

"The Railroad Commission shut down the flaring wells in order to prevent the waste of gas. It shut in the nonflaring wells to prevent them from confiscating part of the oil and gas which would have been produced from the flaring wells but for the shutdown . . . While the (statutes) authorize wells to be shut down completely in order to prevent waste, these articles contain no grant of power authorizing the Railroad Commission to shut down a well completely in order to protect correlative rights . . . The power to regulate the flow . . . Does not include the power to shut down a nonwasteful well completely and stop the flow for an indeterminate time . . .

Profits not a factor . . . "We hold that portion of the order shutting down completely nonwasteful wells in order to protect correlative rights to be void because this action is not included within the power delegated to the Railroad Commission. . . .

"The statutes defining waste enumerate a number . . . but not all wasteful practices. The Railroad Commission has the power and the right to define factually what constitutes waste in a particular field . . . In the order under attack at bar the commission determined that any flaring of gas in the Spraberry field is waste. Since it applies to all flaring operators equally it is not discriminatory. . . . That operators will have a less profitable operation, be delayed in recovering their gas, or be in trouble with their creditors does not affect the commission's duty to enforce conservation by preventing waste. . . .

"Neither does it make the commission's action arbitrary or confiscatory if correlative rights are preserved.

Diligence no test . . . "It is urged that the commission cannot define the flaring of gas as waste unless it first finds that the flaring operators have not been diligent in their efforts to make some productive use of the gas . . . We have concluded that the question of waste cannot be measured by any such test as 'diligence'. . . . A particular operator's capabilities or willingness to risk the construction of pipe lines or gasoline plants are not a limitation on the powers of the commission to define waste for each field. . . .

"The attorney general, speaking for the commission, has asked that this order be either upheld or stricken in its entirety. Upon a consideration of the entire situation we hold this order to be such that because part must fall all must fall.

"In the judgments in some of these cases the Trial Court included direction to the Railroad Commission concerning the allowable. The commission has made a courageous effort to prevent the waste of gas. It may be that through the use of administrative devices not available to the courts the commission can work out its own solution preventing further waste of gas and protecting correlative rights. . . .

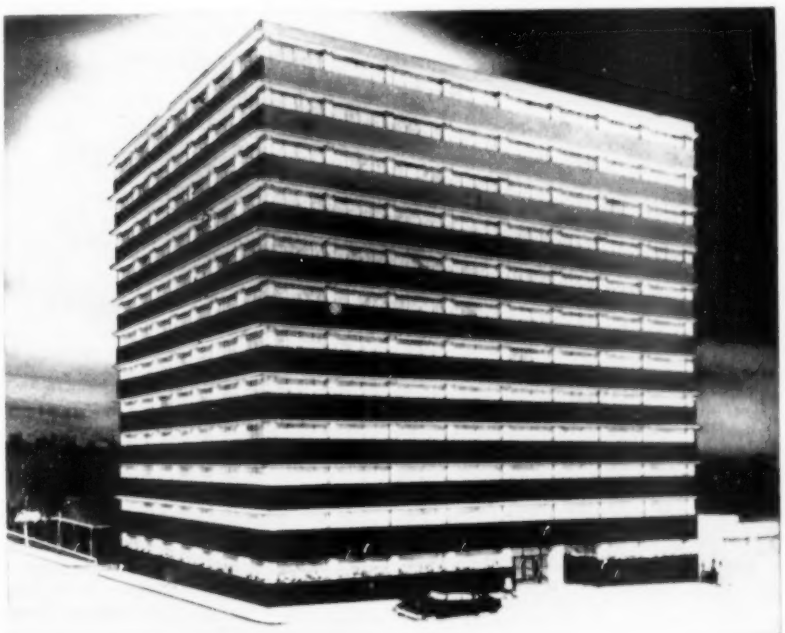
"Many considerations make it seem best to hold that where the courts strike down part of a field order, the court action should be limited to pointing out the infirmity of the order . . . Accordingly, all judgments of the trial court . . . are reversed, the field order shutting down the entire Spraberry field . . . is adjudged to be void, and the commission is enjoined from enforcing it."

Further stay possible . . . Attorneys and operators connected with the case hesitated to express an opinion as to what the next step may be until the text of the court's decision has been studied carefully.

Richards said that he believes the opinion permits the commission to curtail the production of the nonflaring wells so that no more gas can be produced with the oil than can be carried from the field by the gas-transmission lines.

Crux of the decision . . . It was generally agreed that the crux of the case is that the Railroad Commission does not have unlimited power to shut down a nonwasteful operator simply to protect the correlative rights of a wasteful operator in the same field. It may, perhaps, shut down a nonwasteful operator partially or temporarily, or may regulate the flow of his wells, as an incident to a field-wide conservation order, but it cannot penalize him unduly for the benefit of operators who have not adopted conservation practices.

It was pointed out that in a previous case (Brown vs. Humble Oil & Refining Co.) the Texas Supreme Court held that prevention of physical waste in oil and gas production is the dominant concern of the law and that protection of correlative rights is a secondary consideration. The Spraberry decision apparently carries this one step further by virtually directing the com-



Work to Begin on New Sunray Building

Sunray Oil Corp.'s new headquarters building in downtown Tulsa will look like this when construction is completed next summer. Excavation work for the 12-story, 150-ft. by 140-ft. structure is scheduled to begin August 1. In addition to regular office space, the building will contain a 400-seat cafeteria, private club rooms, and general meeting room for the employes. It will have an exterior finish of terra cotta, shading from a dark reddish-brown at the base to lighter tones at the top. A corporation now is being formed to finance the building, in which Sunray will hold 50 per cent of the stock. Architect is Hugh R. Humphreys.

mission to evolve a form of conservation order which will reward nonwasteful operators and penalize those who have been flaring gas.

It was noted that after holding that the commission's order could not stand as written because of its unfairness to nonwasteful operators, the court devoted a considerable portion of its decision to suggesting how the commission might write a better one. For example, the court said that it is not necessary for the commission to pass on how diligent any particular operators may have been in their as-yet unsuccessful attempts to end flaring of gas.

Courts inconsistent? . . . Some observers saw an apparent inconsistency between the Spraberry case and other orders in which the commission has been upheld in closing in an entire field and subsequently permitting wells to reopen one by one as they became connected to gas pipe lines. One explanation offered was that the court was telling the commission to adjust each order to the facts in a particular field and strike a balance between the relative importance of correlative rights and the degree of wasteful production.

Another aspect of the case pointed out by one attorney is that it is a step away from compulsory unitization. By attempting to close the entire field until all wells were connected with processing plants and pipe lines, the commission, in effect, was requiring a degree of unit operation.

What happens next? . . . What will happen next in Spraberry was a subject of great speculation. One guess was that the commission may attempt to apply what has always been considered purely a gas statute, a section of the law which gives it authority to prevent waste by setting a reservoir allowable based on market demand or pipe-line facilities and to allocate this among wells in the field capable of producing without waste.

Since Spraberry gas is casing-head gas produced with oil, this might present for the first time in Texas, or perhaps anywhere, the problem of two kinds of allowables for the same field, with oil allowables fixed on the basis of preventing underground waste and gas allowables from the same wells based on available pipe-line outlets.

Final Decision Near

End of prolonged fight over Texas' gas-gathering tax in sight as pipe-line firms prepare appeal to Supreme Court

AUSTIN.—Whether Texas' long-embattled "natural-gas-gathering" tax stays in effect or is stricken from the books is expected to be decided in the next few months.

The way has now been cleared for a final decision in the case by the U. S. Supreme Court as a result of the refusal earlier this month of the Texas Supreme Court to review its ruling that the tax is valid.

Just when a final decision will be handed down depends upon how soon the companies involved make their appeal (they have 90 days from the date of the Texas court's denial of the motion for rehearing) and how soon the nation's top court can get to the case.

It is considered probable that only two of the three test cases will be appealed — those involving Panhandle Eastern Pipeline Co. and Michigan-Wisconsin Pipeline Co. Operations of both companies involve interstate movement of Texas gas. These firms contend that the tax is unconstitutional on grounds that it violates the commerce clause of the U. S. Constitution. Panhandle transmits gas both interstate and intrastate. Michigan-Wisconsin merely picks up gas near the Texas border for subsequent interstate movement.

The Texas court took no action on a motion for rehearing filed by Amarillo Oil Co. in the third test case. Amarillo, which operates only in Texas, based its suit on the contention that the tax cannot be applied to gas gathered for intrastate consumption unless it also applies to that going to other states. The state court is expected to do nothing in the Amarillo case pending Supreme Court disposition of the interstate question, since the law provides that intrastate gatherers will not be taxed unless those firms piping gas out-of-state also are assessed.

If the tax is finally held to be constitutional, the Texas treasury will be free to spend many millions of dollars in protested payments which have been piling up since about a month after the levy took effect in September 1951.

If the Supreme Court overrules the state court, interstate pipe lines will win an important victory. Such a decision would mean that gas virtually would be tax free from the time it leaves the well head. The existing severance or production tax does not affect the pipe lines.

How the case developed . . . The disputed levy—.45 cent per M.c.f.—was incorporated in a law passed by the legislature in early June 1951 in which the Texas lawmakers also made permanent an existing temporary tax of 5.72 per cent of market value of gas produced in the state.

In effect as of September 1, 1951, the gathering tax ran into a snag almost immediately. Texas Gas Transmission Corp., a major interstate pipe-line firm, paid its September tax under protest, the first step required under Texas law in a test of a law's constitutionality *(The Oil and Gas Journal, November 1, 1951, page 41)*. The company said the law was unconstitutional, an unlawful burden on interstate commerce, and a violation of existing contracts between the company and producers from which it purchased gas. Texas Gas' action was followed in succeeding months by a growing number of large and small pipe lines, until only El Paso Natural Gas Co., among the larger gas exporters, continued to pay the levy without protest.

By agreement between state and company attorneys, the Panhandle, Michigan-Wisconsin, and Amarillo cases were selected from the 51 suits filed as covering all points at issue.

The arguments . . . Hearings were held here in late spring of 1952 before Judge Jack Roberts of the District Court of Travis County. Briefs were filed early in June and oral arguments held early in July 1952. Company arguments followed generally along the line of those put forth initially by Texas Gas Transmission. The state contended that the levy was an occupational tax which did not discriminate against interstate commerce because:

. . . It applies equally to all engaged in that occupation without reference to whether the taxed gas goes into interstate or intrastate commerce.

. . . It was laid on an activity of a local character, separate and apart from the flow of commerce.

. . . It is a taxable incidence which cannot be duplicated in other states should the gas go into interstate commerce.

. . . It is a tax on activities for which the state, through its conservation laws, "gives protection and confers benefits."

Late in July District Judge Roberts declared the tax unconstitutional, holding that "first taking" of natural gas by an interstate line is an inseparable part of moving it in interstate commerce.

District court overruled . . . The state gave immediate notice of appeal, and in February 1953 the Third Court of

Civil Appeals reversed the lower court ruling *(The Oil and Gas Journal, February 9, page 74)*. Justice Hughes, who wrote the unanimous decision, said ". . . . there is no legal reason known to us for fixing the mouth of the well as the dividing line separating state and federal jurisdiction in matters of commerce and taxation. The movement of gas has no necessary relation to interstate commerce or to commerce at all."

Attorneys for the pipe-line companies took the case to the Texas Supreme Court early in April. The latter's first refusal to review the Appeals Court decision came a month later *(The Oil and Gas Journal, May 11, page 84)*. The pipe-line companies then petitioned for a rehearing. The motion was rejected June 3.

Gas-Drilling Boost

Western Natural's West Texas operations show savings in drilling time, number of bits, Wright tells meeting

C. Malcolm Davis

HOUSTON.—Drastic cuts in drilling costs have been effected with gas drilling in West Texas, and while the new method doesn't work equally well in all areas, it holds a lot of promise for the oil industry.

This was the gist of a report made before the Houston chapter of the American Petroleum Institute's Division of Production by Paul Wright, engineer with Western Natural Gas Co., which has used the process extensively in its operations.

The gas-drilling method substitutes natural gas under pressure for mud as a circulating medium to cool the bit and remove cuttings from the hole being drilled.

Examples given . . . Wright cited figures on five West Texas wells which illustrated the savings often possible with gas drilling.

The first well was drilled with about 70 per cent by cable tools, the rest with rotary tools using mud. It required 175 days of drilling time and 30 rock bits to 5,910 ft.

Well No. 2 was drilled with rotary tools, about half with mud and half with gas, used alternately. This well required 71 days and 28 rock bits to 5,696 ft.

The third well averaged about 100 ft. per day with mud and 230 ft. per day with gas. With mud, a bit averaged 128 ft., compared to 390 ft. per bit with gas.

Well No. 4 was drilled almost 100 per cent with gas. Total time was 30 days and 19 bits were required to 6,000 ft.

In another well recently reworked, Wright said, a window was cut in the casing and a sidetracked hole was drilled with gas down beside the old hole, which was drilled with mud. From 4,900 to 5,600 ft. the average rate of penetration using mud had been 17 minutes per foot. With gas, the rate was increased to 1 minute per foot.

Less weight required . . . In his paper, coauthored with Earl Bruno, also a Western Natural engineer, Wright said his company has used gas extensively in drilling surface hole, drilling through lost-circulation zones, and drilling into low-pressure formations.

In addition to the cost factor, Wright said, less weight on the bit is required in gas drilling. In one area, he said, Western Natural drilled a well with mud using 40,000 to 50,000 lb. on the bit. The offset well, drilled with gas, required between 10,000 and 15,000 lb. for the best penetration rates. It was possible, Wright said, to drill with as little as 2,000 lb. on the bit.

Jet bits and bits with special expansion ports drilled over the bearings were tried, but conventional rock bits were usually better than the special bits, he said.

Good Investment

Safety program will save dollars, contractors told

ODESSA, Tex.—Well-planned safety programs are money savers. Figures to support the argument for such a program were submitted by Ben H. Mitchell, Texas Employers Insurance Association, in a recent address before the Permian Basin Chapter of the American Association of Oilwell Drilling Contractors.

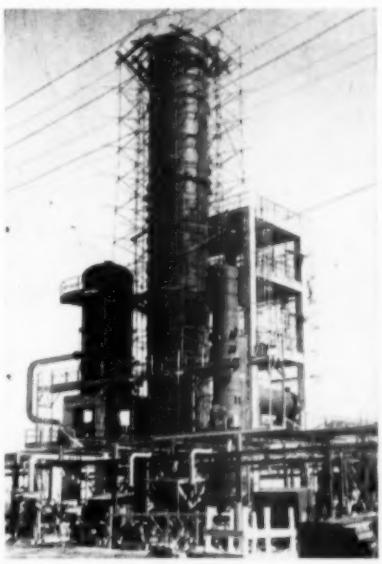
Mitchell produced compensation-insurance figures for 20 companies paying annual premiums of more than $10,000. Ten of these firms had safety programs, 10 had not. The two groups paid the average premium rate. The first received a money credit totaling $1,076,724. The companies without safety programs paid in an additional $200,000.

Four essentials . . . To institute a successful safety program, Mitchell said, a company must see to it that these things are done:

1. Investigate thoroughly the accident history of the personnel it hires—either at the time of hiring or as soon thereafter as possible. Many safety records have been marred through the inadvertent hiring by a company of a man who was unfit for the job from the start due to an old injury or condition. Citing one such case, Mitchell said his company had paid four times for injuries to one individual's back.
2. Inaugurate a regular weekly program stressing safety education.
3. Require a report on every accident from its safety supervisor.
4. Place responsibility for the safety program with some member of the top company management.

Graphite frecs . . . Addition of graphite frecs to the mud system of a drilling rig will help demagnetize the drill string, reduce torque, inhibit corrosion, and increase pump and swivel life, Art Townsend, executive vice president of Cardinal Chemical Co., told the contractors.

About 4 lb. of graphite should be added to each barrel of mud, Townsend said.



More Crude Capacity

Construction of this crude unit is nearing completion at Suntide Refining Co.'s new 30,000-bbl.-daily refinery at Corpus Christi, Tex. The unit is expected to go on stream about the end of July, with other facilities, including fluid catalytic cracker, catalytic polymerization plant, and alkylation unit, beginning operations in succeeding months. Ground was broken for the new refinery in March 1952 (The Oil and Gas Journal, March 24, 1952, page 225). The plant will be operated in conjunction with crude-oil-gathering facilities of Sunray Coastal Pipe Line Co. and Sunray's deep-water barge and tanker docks at the Port of Corpus Christi.

Preignition Problem

It's a tough challenge to the oil and auto industries; experts agree there's much to learn before it can be met

ATLANTIC CITY.—Preignition—the premature igniting of fuel gases by glowing engine deposits—looms as one of the biggest joint headaches of the petroleum and automotive industries.

Given a boost by the new higher-compression engines, the problem has grown to serious proportions and has refiners and engine designers alike searching for solutions.

Latest knowledge on the phenomenon, gathered from laboratory studies and field tests with a variety of automobiles, was outlined here last week at the annual summer meeting of the Society of Automotive Engineers.

R. F. Winch, research engineer for Sun Oil Co., described field tests using 30 cars, 21 of them 1952 models of Cadillac, Chrysler, Packard, Oldsmobile, Buick, DeSoto, Chevrolet, and the 6-cylinder Ford, and the rest 1953 models of Cadillac, Oldsmobile, Buick, Dodge, and Chevrolet.

The results, Winch said, indicate that preignition is a significant and serious problem. It was present in almost all of the 30 cars, including eight of the nine 1952 models. Some of the 1953 models were improved over their 1952 counterparts, while others were noticeably worse, he said.

Knock and preignition, Winch declared, are separate and different phenomena; both can occur at the same time in an engine, or they can be present independently. It is also known, he said, that knock can bring on preignition and, most certainly, preignition can cause knock.

The Sun engineer suggested two possible fields of investigation which might bring relief:

...Fuels and lubricants offer one opportunity. Some basic studies are needed to find out what fuel property or properties determine preignition resistance of a fuel and how to increase this resistance.

...Engine design also holds hope for correction. Designers should become increasingly aware of preignition, both audible and inaudible, and consider it "with the respect and ingenuity" previously given the detonation problem.

The old solution to the knock problem—increasing the octane number of the fuel—doesn't really apply to the preignition problem. Octane numbers will help suppress the noise of wild ping but they are relatively ineffective in curing basic preignition, Winch said.

Regarding engine design, he cited two examples of necessary correction. In one make of car, cylinders 3 and 7 were the preigniting cylinders in almost all cars studied. Correction in these two cylinders would mean a much lower preignition rating for the car. In another make, he said, no two of the eight pistons had the same dome-surface smoothness and the piston with the most pronounced surface irregularities was consistently in the most serious preignition difficulty.

Fuel factors . . . Fuel composition and volatility were found to be definite factors in "deposit-induced ignition" by three members of Ethyl Corp.'s research and engineering department. Laboratory studies, they said, showed that a reduction in fuel end point reduces deposit ignition.

Among individual leaded hydrocarbons, they said, aromatics produce by far the most deposit ignition, but lubricating oils also are a factor. Oil volatility affects deposit ignition, which is reduced by the lower boiling oils. The amount of deposit ignition is directly related to the amount of oil entering the combustion chamber, they concluded.

Autoignition . . . General Motors Corp.'s contribution to the symposium concerned a discussion of factors related to the problem of autoignition, which is characterized by erratic sharp knocking or dull, thudding sounds which persist after electrical ignition has been cut.

Their experiments indicated to them that autoignition can be eliminated by increasing fuel antiknock quality, but that the Research octane number required may vary slightly depending on fuel composition. From limited evidence, they believe that aromatic constituents of gasoline are somewhat less effective in suppressing autoignition than are paraffin hydrocarbons.

Their experimental observations showed the effectiveness of tricresyl phosphate additions to leaded gasoline during deposit accumulation. Tests indicated that addition of the quantity of this additive theoretically required to convert all of the lead in the fuel to lead phosphates lowered the Research octane number required to eliminate autoignition by approximately three octane numbers.

The General Motors authors did not discuss the effect of engine design on autoignition.

Gas Begins Eastern Journey at This Station

One of the gas-transmission industry's many new compressor stations is this Texas Eastern Transmission Corp. installation near Kosciusko, Miss., at the southern terminus of the company's new line from Kosciusko to Connellsville, Pa. The Kosciusko station has five 2,500-hp. gas-engine-driven reciprocating compressors. Shown here in this night shot of the station are the suction and discharge manifolds and the air filters installed two to each engine.

Cartel Answers Filed

Government lost nothing on Marshall Plan shipments; also, pricing-method details were known continually, court told

Dahl M. Duff

NEW YORK.—American suppliers of Arabian crude oil have told a federal court in New York that, regardless of the price charged on ECA-MSA financed shipments, the United States Government didn't lose because the equivalent amount of money was set aside by the foreign governments in U. S.-controlled counterpart funds.

This point was made in the companies' answers to the lawsuits filed by the Justice Department last August asking recovery of some $67,000,000 for alleged overcharges on shipments to Marshall Plan countries between May 1949 and June 1952.

The answers provided the first official indication of at least a part of the companies' defense. As for the main issue of whether there had been overcharges, the companies confined themselves to a general denial and left the details for the trial. This isn't expected for probably another 2 years because of the crowded federal docket.

Overcharge denied . . . Even if there were overcharges—something which the companies aren't for a minute conceding—there is some question whether the government is suing the right party. The U. S. Government paid the dollars to the foreign governments, not to the oil companies, whose dealings and sales were to various private importing companies in the countries concerned.

The answers dwelt at length on the existence of the Marshall Plan counterpart funds. The full amount paid for the crude oil was in every case placed in the special "counterpart fund" account by the foreign government concerned. This was in local currency and could be used only with ECA-MSA approval. Hence, the U. S. Government was completely reimbursed for whatever price was paid, the money being eventually spent for basic recovery purposes of the Marshall Plan program.

Defendants in the three cases are the main "offtakers" of Arabian American Oil Co. and their sales subsidiaries—(1) Standard Oil Co. (N. J.) and Esso Export Co.; (2) Standard Oil Co. of California and The Texas Co. and subsidiaries, Caltex, Caltex Oceanic, Mid-East Crude Sales, and Bahrein Petroleum; and (3) Socony-Vacuum Oil Co., Inc., and Socony-Vacuum Overseas Supply Co. Originally, the Government asked $31,795,000 from Jersey, $14,118,000 from Socony-Vacuum, and $21,428,000 from Caltex and its parents. The amount has since increased with interest.

Background . . . These American companies are the sellers of the only dollar crude oil in the Middle East and thus the only ones whose sales were made with the benefit of ECA-MSA financing. Much of the Government's case against the companies revolves around interpretation of ECA-MSA regulations. These questions were under discussion at various times for several years prior to the filing of the suits. In fact, the answers the companies filed in court pointedly mention the fact that at all times the ECA and the MSA had full information of what prices were being charged and how they were determined.

Although the going posted price in the Persian Gulf for 36°-gravity crude is $1.75 and was previously $1.88, Aramco sells the oil to its own shareholding companies for $1.43 on what amounts to intercompany transactions. A relatively small quantity—about 10 per cent—of the Aramco production was imported into the United States. ECA contended these fractional sales, worked back on an f.o.b. basis by netting out freight, established a low market price which should have also been charged in Europe.

The going price at Sidon, the Eastern Mediterranean at the Tapline terminus, was $2.41. ECA alleged an overcharge on these shipments, claiming the crude should have been $1.43 with an allowance for transportation representing the approximate cost of operating the line. The Sidon price is arrived at by a method of equalizing the laid-down price in Western Europe between the Persian Gulf and the Eastern Mediterranean.

Delhi Plans Reorganization

DALLAS.—Delhi Oil Corp. stockholders will vote June 25 on a proposal to reorganize Canadian Delhi Oil, Ltd., in which Delhi has 80 per cent ownership.

Reorganization plans call for the new company to be named Canadian Petroleum, Ltd., which will issue one share of stock for each share of Canadian Delhi outstanding. The exchange will make Canadian Petroleum a wholly owned subsidiary of Delhi.

Clint W. Murchison, Delhi president, said the reorganization is needed to establish a clear division between Delhi Oil's domestic and Canadian operations. It was also pointed out that Trans-Canada Pipeline, Ltd., a subsidiary of Canadian Delhi, may need to borrow large sums of money to finance a proposed natural-gas line, and the reorganization would afford the Canadian firms a market for stocks in that country.

Anniversary Celebration Set

HANOVER, N. H.—Dr. Robert E. Wilson, board chairman of Standard Oil Co. (Ind.), will be principal speaker at Dartmouth College ceremonies June 26 commemorating the 100th anniversary of the world's first scientific examination of crude oil.

Dr. Wilson will describe the advances made by the oil industry since 1853 when two Dartmouth professors, Dr. Dixi Crosby and Prof. Oliver P. Hubbard, examined a sample of "Pennsylvania rock oil" and found it to be valuable.

Other speakers will include Secretary of Interior Douglas McKay, New Hampshire's Gov. Hugh Gregg, Dr. Paul H. Giddens, president of Hamline University, St. Paul, Minn., John S. Dickey, Dartmouth president, and Col. J. Frank Drake, Gulf Oil Corp. board chairman.

Industry Briefs

NEW ORLEANS.—A $500,000,000 suit claiming title to nearly 4,000 acres of Spindletop field was dismissed here last week by the U. S. Fifth Circuit Court of Appeals. Three Tennessee men, L. B. Glover, W. M. Foust, and Hase Brantly, contended they were the true heirs of an original owner of the land who gained acquisition through a Spanish land grant. The court ruled that this was true but that courts have repeatedly held that under law in force at that time aliens to Mexico could not inherit real property. This ruling applied in the huge suit, the court said.

DALLAS. — Kennilworth Oil Corp. has purchased 11 wells in West Stamford field of Haskell County from E. K. and E. M. Burt, Wichita Falls; David Stephenson, San Antonio; and C. F. Passell, Abilene. Kennilworth is planning a water flood in the field. The properties have been valued at $3,500,000.

KANSAS CITY.—A course in the gas industry's legal problems surrounding production, transportation, refining and marketing will be taught this summer at the University of Kansas City's law school.

ECONOMICS

PAD Cautions Refiners

Product demand is becoming more and more seasonal, will require big adjustments in yield patterns, report says

WASHINGTON.—The heaviest seasonal decline in product demand in the history of the industry prevails throughout the entire country east of California.

It is estimated by the Petroleum Administration for Defense that demand through the quarter now ending will be approximately 937,000 bbl. daily less than in the first quarter of this year.

The second-quarter drop last year was 871,000 bbl. outside of California.

The rapid rise in the use of oil for space heating since the end of the war has set a new pattern in demand, it was explained by Deputy Administrator J. Ed Warren, because of the increasing importance of the heating-oil market, demand for products as a whole has become more and more seasonal.

This new trend toward greater seasonal variation in demand has been partly obscured by the Korean invasion in 1950, the Iranian shutdown in 1951 and the domestic refinery strikes last year, Warren said. These events distorted the normal demand pattern and it was only this year that it became fully apparent.

Adjustments necessary . . . Prior to the end of the war, when the range between first and second quarter demand was smaller, no substantial seasonal shift in industry operations was necessary and fuel product stocks could be built up in summer and drawn down in winter with industry operations maintained at a relative stable year-round rate.

As the magnitude of the variation has increased, however, important seasonal adjustments in operations have become necessary, Warren said.

As recently as 1950, the drop in second-quarter demand was only 363,000 bbl. daily. In 1951, however, it doubled, to 730,000 bbl. daily. This year, for the first time, the decline topped the 900,000-bbl. mark, despite the fact that first-quarter demand was strong and slightly above forecasts made at the beginning of the year.

Estimates by PAD indicate that demand for products in the two winter quarters of a given year now reaches a level about 900,000 bbl. daily higher than demand in the two summer quarters.

Gasoline Price Raised

NEW YORK.—Higher prices for gasoline in New York and New England were posted by Socony-Vacuum Oil Co., Inc., effective June 10.

Socony's increase for tank-wagon delivery was 0.7 cent a gallon except in some parts of upstate New York, where it amounted to 0.6 cent.

Late in February of this year, Socony posted an increase in gasoline prices averaging about 0.5 cent a gallon but returned to the old schedule a week later when several other major suppliers failed to follow.

Esso Standard Oil Co., Atlantic Refining Co., and Sinclair Refining Co. met the Socony increase within 24 hours. The support by these companies plus the strong gasoline market in the area make it likely that the increase will become general.

Socony cited increased costs and heavy expenditures as making higher prices necessary.

CANADA

Pipe-Line Scrap

Hearing to decide who will move Alberta gas is opened

CALGARY, Alta.—Hearings opened here last week before the Alberta Petroleum and Natural Gas Conservation Board on four proposals to pipe western Canadian gas to eastern Canadian markets.

First topics taken up were data on reserves and geology. This testimony will be followed by debate on markets, deliverability, and routes.

Representatives of the four companies—Trans Canada Pipe Line, Ltd., Western Pipe Lines, Ltd., Northwest Natural Gas, and Mid-Continent Pipe Lines—look for a grueling scrap which could last until fall.

They also expect that the board will report that proved natural-gas reserves in Alberta now total about 12 trillion cubic feet. Alberta's gas requirements have been established by the board in previous hearings at approximately 6.8 trillion cubic feet. If requirements figure is not increased, gas available for export would exceed 5 trillion cubic feet—considered sufficient to supply any one of the four projects for 15 to 20 years.

Argument is expected to be most heated over testimony on markets and routes.

Trans Canada Pipe Lines, the only firm to have its application before the board with the necessary supporting data by the May 25 deadline (the other companys are seeking an extension), proposes a line extending from southern Alberta around the Head of the Lakes to Ontario and Quebec. The only other company proposing an All-Canadian route is Northwest Natural, whose line would follow roughly the same route and serve about the same area.

Mid-Continent Pipe Lines plans a line following the southern route to serve the same area, roughly parallel to the crude system of Interprovincial Pipe Line Co.

Western is pushing a proposal to lay a line east to Winnipeg, Man., turning south to a point near Emerson at the International boundary. The gas would be turned over at the border to a United States firm which would serve the area around St. Paul and Minneapolis, Minn.

Gulf States Gets Farmout

WINNIPEG, Man.—Gulf States Oil Co. of Canada has taken a 1,000,000-acre farmout from Fargo Oils, Ltd., and plans to begin a drilling program on part of the area immediately.

Geophysical work already has been started. Gulf States, a wholly owned subsidiary of Western Natural Gas Co. of Houston, has agreed to spend $1,500,000 on the 2-year project.

Under a contract effective June 1, all exploration and discovery costs will be borne by Gulf States. However, any oil and gas fields discovered will be owned jointly and equally.

A. H. Meadows, executive board chairman of General American Oil Co., Dallas, Fargo's parent company, said: "In effect, this marks the launching of Canadian operations by one of the largest American gas companies as protection against diminishing gas supplies in the United States."

Truce Won't Affect Oil

Expansion to continue whether peace comes or not; savings in Korea merely to be transferred, administration says

WASHINGTON. — The Eisenhower administration will not permit a truce in Korea to halt the oil industry's expansion program or other industrial mobilization plans.

The cessation of actual fighting, in fact, is expected to have little impact on military oil requirements. What may be saved in Korea will merely be transferred elsewhere. Military requirements, over-all, amount to only 8 or 9 per cent of our domestic demand. Actual use in Korea probably has been in the nature of 1 per cent.

While administration officials place great hope in a truce, there is nothing in it to indicate whether it is a first step toward real peace, which it might be, or merely a pause before new acts of aggression involve us in other "police actions." Only Russia can say which it will be and administration leaders, remembering how in the past we have been caught with our defenses down, are anxious that the nation not be lulled into a false sense of security.

Until peace is assured, the Government will continue its defense planning in a big way. So long as the possibility of war remains, the expansion of our productive and refining capacity for oil will be encouraged and supported.

Effects of truce . . . Just what effect a truce will have upon our industry economy is a matter on which there are many different viewpoints. Some industrialists predict a sharp cutback in military procurement, even to the point of a serious recession, but government economists expect nothing more than a slight dip toward the end of the year.

Experts in the Petroleum Administration for Defense think the cessation of fighting will have no appreciable effect on the oil industry.

Combat requirements for aviation fuel will be lessened when fighting planes are grounded in Korea, but military leaders do not believe this will do more than ease the precarious procurement problem. They will still want the expansion of alkylate facilities which has been planned, which will be needed as Air Force strength increases and training activities are stepped up.

There will be some reduction in fuel requirements for military transport as the tonnage of munitions for Korea falls off but on the other hand it is anticipated there will be increased requirements to move materials for the rehabilitation of the South Korean economy which this country undoubtedly will furnish.

It is probable there will be a reduction in the rate of munitions production as military stockpiles are replenished from output which heretofore has been shipped direct to Korea. There may be a slowing down of the rate of production of some types of heavy equipment, and it is from these areas that the impact of a truce on our industrial economy may come.

Public-works question . . . Some confusion has arisen because the administration in the past few days disclosed it is making plans for a multibillion-dollar public-works program against the possibility of a depression. Officials generally deny this has any direct relation to the Korean situation. It is keyed, they say, to the possibility of a recession after the defense program is consummated and is basically an insurance policy against a possible but not inevitably contingency.

The major assurance that substantial volumes of oil, food and other materials will continue to be required lies in the fact that a large military force will undoubtedly have to be maintained in Korea for some time to come. What is being negotiated is a truce, not a peace treaty—a temporary arrangement which can be ended by intentional or unintentional actions by either side.

There will be much greater significance to the political discussions which will follow the truce than to the peace talks at which it was arranged.

Controversy Prolonged

Coastal states, administration to tangle in Senate this week over management of operations in Continental Shelf

WASHINGTON.—Coastal-state senators are expected to make a last-ditch effort this week to secure a voice in the management of oil and gas development in the Continental Shelf and a share in the revenue when the Senate takes up legislation setting up machinery for federal operation of the submerged-lands resources.

Even the most ardent supporters of state participation, however, admit that the chances for anything other than flat application of federal laws to the offshore areas are very dim.

The fight will be led by Sens. Price Daniel of Texas and Russell Long of Louisiana. They will seek to have the conservation and other laws of the coastal states applied to the territory beyond their seaward boundaries and to have, in return for policing, the right to extend their production taxes to the Continental Shelf area.

If the states fail in their effort to have these provisions incorporated in the bill, which now appears probable, the measure will be entirely closed to such amendment, since a bill passed by the House does not provide for state participation. Under the rules, the conference committee, which will have to reconcile differences between the Senate and House, will not be able to consider the matter, since it cannot put into a bill anything that has not been included by one or the other chamber.

Administration's stand . . . Administration policies call for use of the federal maritime and other laws to control crime and regulate operations in that portion of the Continental Shelf reserved to the federal Government in the "quitclaim" bill signed by President Eisenhower last month.

This was made clear in an opinion by Atty.-Gen. Herbert Brownell, Jr., who, however, did not go into the reasons for the administration's position.

Testifying before the Senate Interior Affairs Committee recently, Asst. Atty. Gen. J. Lee Rankin asserted it would be "unconstitutional" to apply state law to the submerged lands. He suggested that the laws of the District of Columbia, which were enacted by Congress, could be applied in civil cases involving the Continental Shelf but maintained it would be illegal to use the laws of the coastal states.

States' position . . . A large number of senators, however, support the contention of Texas and Louisiana that the laws of the adjoining states should apply to operations in the Continental

WATCHING WASHINGTON

Bertram F. Linz

Rubber Plants Will Sell

Oil and rubber companies already are lining up to buy the Government's synthetic-rubber plants.

Although legislation directing the sale of the facilities is in its initial stage, there are indications the Government will encounter little difficulty in arranging sales at good prices for many of the plants.

O. V. Tracy, general manager of the chemical-products department of Esso Standard Oil Co., disclosed before the House Armed Services Committee his company plans to bid on the butyl facilities at Baton Rouge, La., if they are put up for sale. P. W. Litchfield, chairman of the board, indicated Goodyear Tire & Rubber Co. is interested in the copolymer plants it built and operates at Houston, Tex., and Akron, Ohio.

Economic factors indicate the synthetic-rubber industry next year will enter upon an era of expansion, since natural-rubber production is seen as remaining relatively stable for at least 3 years while world demand continues to increase.

Shelf Leasing Perplexing

Congress has not yet enacted legislation for management of the federal Government's share of the Continental Shelf, but Interior Department officials are studying problems which will be encountered in this new venture.

There will be no noncompetitive exploration permits for wildcatters in the Continental Shelf such as are granted for the public lands. All leases will be awarded on competitive bids.

As the work of leasing the Continental Shelf gets under way, a number of problems will arise which are not encountered in leasing the public lands.

Acreage covered by many leases will be larger than that of some counties and difficulties are foreseen in defining their boundaries because of the present uncertainty of just where state boundaries fall offshore.

If the Continental Shelf is placed under federal law, as urged by the administration, the Interior Department will have to make the conservation rules and figure out allowables necessary.

If the states are permitted to apply their conservation laws to the area, administration will be much simpler, although Continental Shelf operators will have to accommodate themselves to some federal maritime statutes.

Operators will be granted leases for specific commodities. A holder of an oil and gas lease who may discover a sulfur deposit will not automatically be entitled to develop it. To do so he will have to secure a sulfur lease, probably with no preference over any other bidder.

Investigation Record

Although it has not gone into many matters involving oil, Congress has managed to make a number of investigations into problems inherited by the Republicans when they came into power.

The record for the first 5 months of the Eisenhower administration includes studies of the naval petroleum reserves, resulting in the abandonment of exploration on the Government's lands in Alaska and new drilling for conservation in Elk Hills; the tidelands situation, resulting in return to states of lands within their historic borders and pending plans for operations in the rest of the Continental Shelf; and the reciprocal trade program, with indications no limitations upon imports of oil will be imposed this year.

Also, the House Interstate Commerce Committee heard officials of the federal regulatory bodies, including PAD, explain their operations and problems, and other committees delved into the defense program, the situation of small business, foreign aid and misconduct in the Internal Revenue Bureau and Department of Justice.

Several prospective investigations probably will be deferred until next year. These include a study of our fuel reserves and another effort to spell out a national fuel policy which the Senate Interior Committee was authorized to make; FPC authority over production and gathering of natural gas; general study of natural-gas industry by House Interstate Commerce Committee; and a probe of antitrust laws and their administration.

Shelf off their boundaries. Particularly in the case of these two states, the only ones so far to have operations both inside and beyond state boundaries, it was argued that confusion would result from attempting to apply one set of laws to operations within the state boundaries and a different set on the other side of the state line. The only practical way to manage the shelf and enforce conservation practices efficiently, it was asserted, is through use of the state statutes.

A major objection of the states is directed to the distance operators in the Continental Shelf would have to travel and the expense to which they would be put in prosecuting or defending court cases arising out of their operations or leases. The nearest federal jurisdiction in which such cases could be brought under the federal laws would be Santa Fe, N. M., or Washington, D. C., about equidistant from the Texas-Louisiana Gulf Coast.

Senators Daniel and Long pointed out at the committee hearing that there are few lawyers in those states who know much about maritime law and that the oil operators knew even less. Daniel said Texas was willing to exercise its authority over the outer Continental Shelf if the Government permits, even if the state receives no revenues from the area, as a service to Texas oil operators who will be working in the area.

Senate Approves Rifle Funds

WASHINGTON. — The Senate appropriations committee last week approved the House's restoration of a $1,000,000 fund in the Interior Department's appropriation bill for continuing the oil-shale plant at Rifle, Colo., and added $476,000 for research work at Laramie, Wyo.

The House appropriations committee had refused to approve any funds for the Rifle plant. It reasoned that if work at Rifle was further advanced than work at the Louisiana, Mo., demonstration plant, which is being closed down, it too should be discontinued.

When the bill came up for action on the House floor, however, the fund for Rifle was put back, but no money was provided for the Laramie laboratory. Department officials told the Senate committee that if the work at Laramie was discontinued there would be no point in continuing the Rifle project and, conversely, if the work at Rifle was to go on it was vital that the supporting research be retained.

The Senate committee also approved appropriations of $667,000 for research on synthetic liquid fuels from coal at

the Bruceton, Pa., laboratory, and $850,000 for research on the gasification of coal at Morgantown, W. Va.

Navy Pulling Out

Bases for Alaskan venture to be closed by October 1

WASHINGTON.—The Navy Department's search for oil in Naval Petroleum Reserve No. 4 in Alaska will be finally dissolved within the next few months.

The field camp at Umiat will be placed in caretaker status by the end of this month, and the main camp at Point Barrow will be in the same status by October 1, Secretary of the Navy Robert B. Anderson has reported to Rep. Leon H. Gavin of Pennsylvania.

Some of the heavy oil field equipment will be stored in Alaska, and other equipment, materials, and supplies will be transferred to other government agencies which can use them.

Decision to abandon the prospecting program was announced by Anderson last March 6 during his appearance before the House Armed Services Committee at which Gavin reported the results of an intensive study he had made of the project. *(The Oil and Gas Journal, March 16, page 87).*

The exploration program was started in 1945. The Navy Department under the Truman administration planned to run it for 10 years, closing it out in 1956 at a total cost of approximately $75,000,000 to $80,000,000. Actual appropriations to the end of the current fiscal year were reported by Gavin to have totaled $52,765,000, of which approximately $45,000,000 has been spent.

No commercially exploitable oil was ever found in the area tested, but Anderson wrote Gavin that "the information obtained during the exploration will be recorded and will consist of much data of general scientific value or of specific value for oil exploration in the Arctic area of the North American continent."

New Controls Plan

Borrowed industrialists are core of new Commerce idea

WASHINGTON.—If the Defense Production Act now pending in Congress is extended the administration will continue the remaining necessary functions of the National Production Authority, such as allocations for defense and atomic energy developments, and will set up in the Department of Commerce some 20 main industry divisions with men borrowed from industry in key positions.

The plan, announced last week in Atlantic City by Commerce Secretary Sinclair Weeks, will give his department's defense activities a setup similar in form to the Petroleum Administration for Defense but with less autonomy.

The new arrangement will be beneficial to PAD in dealing with materials problems that may arise, since the Commerce Department will have a steel division headed by an industry man with whom PAD officials will be able to take up questions of supply as they arise. There will be other divisions dealing with matters of importance to the oil and gas industry, including chemicals and electronics.

Weeks explained that the chairman of each commodity division will be an outstanding industrialist recommended by his industry, serving full time without pay on a 6-month rotating basis. He will be assisted by a capable deputy from the federal career service.

Advisory committees to be established for the commodity divisions also will be manned by leaders in their field, serving without pay and meeting at periodic intervals.

The setup apparently will be patterned along the line of the PAD and National Petroleum Council.

The advisory committees, like the NPC, will obtain data required by the Government and keep up-to-date industry organization plans for crisis.

Trade-Pact Foe

Wormser says free market better than federal control

BUTTE, Mont.—The Eisenhower administration will resist any proposals for international commodity agreements on oil, rubber or other commodities, whether under the auspices of the United Nations or suggested by international producers.

"One of the great fallacies abroad in the world today is the feeling we must have mandatory government stabilization in practically everything that contributes to our industry or existence," Assistant Secretary of the Interior Felix E. Wormser said in addressing the commencement at the Montana School of Mines June 5.

No scheme yet devised for stabilizing an international industry has worked, and the free market can do the job quicker and better, Wormser declared.

The United States currently is party to two such agreements, one on wheat which has cost the country over $600,000,000 and the other on scarce metals and minerals.

"The danger in these international agreements and conferences is not only their futility but the fact that they often seize upon an emergency, such as we have had in the last few years, and attempt to replace our voluntary system of cooperation, known as the free market, with impossible government regulation of production and prices, never with satisfactory results," Wormser said.

Wormser pointed out that the United Nations has published studies advocating commodity agreements or government cartels to bring about international economic stability. His words recalled the proposal made some 6 years ago to have the U. N. take over control of the international oil trade and a recent suggestion that it call a conference on rubber.

Refining Dividends Down

WASHINGTON.—Publicly reported dividend payments by refining corporations in May dropped to a low of $3,600,000 from $13,500,000 in the corresponding month last year.

Department of Commerce officials reporting the figures, however, attributed little importance to the drop which they said was occasioned by an alteration of payment dates from May to June.

With the low May payments, total dividends for the first 5 months dropped to $251,300,000 from $258,000,000 in the corresponding period in 1952, but this decline is expected to be offset when totals for the first half of the year are announced.

ROCKY MOUNTAIN

Repressuring Date Set

DENVER.—The Colorado Oil and Gas Conservation Commission has set August 31 as the effective date operators must begin repressuring operations in Rangely field.

The commission's order, which was expected to be effective July 1, was upheld in a district court recently *(The Oil and Gas Journal, June 8, page 74).* An appeal to the state Supreme Court is pending.

Rangely is the nation's sixth largest field, covering approximately 20,000 acres. Presently 531 wells are producing about 61,000 bbl. daily with an accumulated production of over 100,000,000 bbl. Reserves are estimated at about 200,000,000 bbl.

Search Accelerated

Anglo-Iranian conducting exploratory operations in five widely separated areas in drive to replace Iranian oil

Dahl M. Duff

THE Anglo-Iranian Oil Co., Ltd., has stepped up its exploratory work throughout the world since the loss of its Iranian properties. The company now is participating in five separate programs and during the last year obtained rights over offshore marine areas from two of the Trucial Coast shaikhdoms in the Persian Gulf.

In refining, Anglo-Iranian expects to have a total capacity of about 600,000 bbl. daily by the end of next year. Much of this results from construction carried out since the shutdown at Abadan. Among other projects, it includes the 100,000-bbl.-daily Aden refinery and the 60,000-bbl.-daily project in western Australia.

These and other facts on the company's operations were reviewed in the recently distributed annual report. Anglo-Iranian's provisions for depreciation were $26,555,208 less in 1952 than in 1951, and net profit for 1952 was equivalent to $70,464,704. This compares with profits of $67,852,540 in 1951. United Kingdom taxes were $63,465,763 in 1952 and $76,646,922 in 1951.

The new concessions . . . The two offshore Trucial Coast concessions obtained by the company are in Abu Dhabi and Dubai. The report gave no details on these undertakings other than to note that the company was associated with French interests in Dubai. The Abu Dhabi concession was relinquished by Superior Oil Co. about 1½ years ago at the same time that Superior gave up similar rights in Qatar.

Under the terms of arbitration awards, these marine concessions cover the areas beyond the territorial limits, or about 3 miles. The French interests associated with Anglo-Iranian at Dubai are understood to be Cie. Francaise des Petroles, in which the French Government has minority interest. Both Anglo-Iranian and C.F.P. are Iraq Petroleum Co., Ltd., shareholders formerly bound by the now-dissolved Red Line agreement.

Discussing its other exploratory ventures, the company report said preliminary geological and seismic work in Sicily is encouraging. In Nigeria, one well was completed dry and two more are now drilling in a program in which Anglo-Iranian is associated with Shell. Shell and Anglo-Iranian also are doing geological and geophysical work in Tanganyika and Zanzibar. In Papua, Anglo-Iranian is participating with American and Australian interests in a program now concentrated in the western part of the territory. Trinidad Northern Areas, Ltd., one-third Anglo-Iranian, is preparing to drill in a marine area in the Gulf of Paria and also in the Central Range Reserve.

The Scottish shale-oil industry is faced with an exceedingly difficult situation, the Anglo-Iranian report said. Shale-oil production last year was 106,500 tons, 2,000 tons more than in 1951, but higher costs of supplies, principally coal, pitwood, and chemicals, and increased wages and salaries and lower paraffin wax prices, caused the shale industry to operate at a loss in 1952. Conditions have continued to deteriorate this year, it said.

Middle East production . . . The company's production in Kuwait, Iraq, and Qatar totaled 512,000 bbl. daily (tonnage figures converted on the basis of 1 million tons being equivalent to 20,000 bbl. daily) against 332,000 bbl. daily in 1951. Crude available to Anglo-Iranian during 1953 from these sources is expected to average about 700,000 bbl. daily.

Anglo-Iranian's program for increasing its United Kingdom refining capacity is near completion, and capacity will amount to about 210,000 bbl. daily by the end of this year. Throughput of the continental refineries was further increased. At the Marghera plant in Italy, a new thermal reformer was completed in October, and a catalytic polymerization plant is under construction as well as manufacturing facilities for industrial lubricants. Additional lubricating-oil facilities are being built in the Schindler refinery in Germany. The Haifa refinery is still running at less than a quarter of its 80,000-bbl.-daily capacity. The Kuwait refinery last year processed about 25,500 bbl. daily.

Last year was the first full year in which the company operated without its Iranian properties. Despite this and despite the world scarcity of tanker tonnage early in 1952, the Anglo-Iranian group's sales of crude and products last year totaled slightly more than 640,000 bbl. daily, a decrease of only about 60,000 bbl. daily, or 8.6 per cent, from 1951.

"In order to achieve this volume of business, we have supplemented the maximum use of our own resources both by hiring refining capacity, through which means we have had some 3,000,000 tons (60,000 bbl. daily) of crude processed, and by purchasing a total of nearly 7,000,000 tons of oil (140,000 bbl. daily), mainly in the form of refined products," the report said.

Position improved . . . The company's position improved considerably during 1952. Early in the year, crude purchases were discontinued, and sales in the second half of the year exceeded those for the first half by about 30,000 bbl. daily.

The company's summary of operations was prefaced by a review of developments in the Iranian dispute, including the proposals made in the fourth and fifth attempts at settlement last August and again early this year. Discussing the plans for compensation—the main issue on which the latest settlement efforts failed—the report said:

"No reliance could be placed on the award and payment of compensation by methods so conjectural and so completely noncommittal as those provided under the (Iranian) nationalization laws. . . . The Iranian Government has neither paid compensation nor agreed to a satisfactory basis and procedure for the future assessment and payment of compensation, and the practical effect of the laws has thus amounted to confiscation."

LATIN AMERICA

Creole Hikes Production

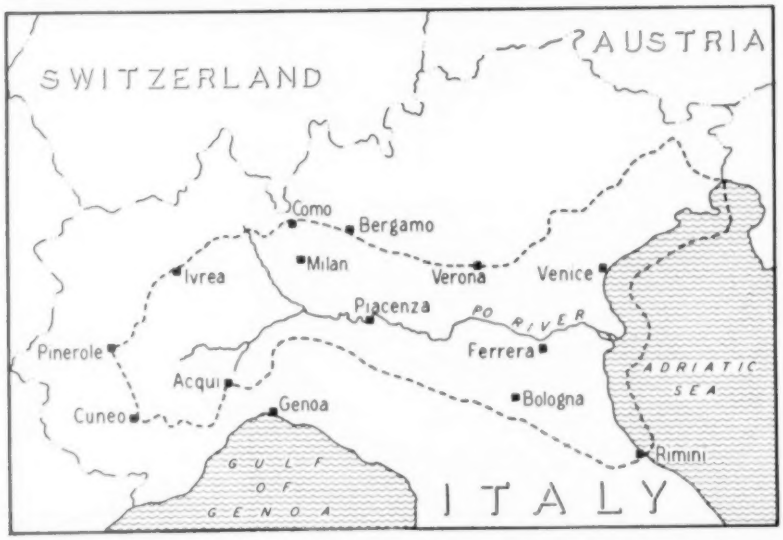
Operated crude-oil production by Creole Petroleum Corp. during March averaged 714,106 bbl. daily, up 4,137 bbl. daily from the previous month but still far below the record 803,424 bbl. daily last December.

Of the March output, 584,794 bbl. daily came from Lake Maracaibo, 5,549 bbl. daily from elsewhere in Western Venezuela, and 123,763 bbl. daily from Eastern Venezuela. Net production plus

purchased royalty oil amounted to 771,039 bbl. daily during the month.

March runs at Caripito were 60,987 bbl. daily, and at Amuay, 76,835 bbl. daily. During March, Creole operated an average of 18.2 rigs and completed six exploitation and six exploration wells. Of the exploratory wells, three were successful—one in Pilon, initial production 170 bbl. daily and 3,717 ft. total depth, and two in Maracaibo, average initial production 407 bbl. daily, with average total depth, 6,746 bbl. daily.

EUROPE



PO VALLEY, encompassed by dotted line on map and considered to be one of the most attractive regions in Europe for oil and gas accumulation, now closed to private development.

State Monopoly Created

New Italian Government oil agency gets exclusive right to explore and develop in Po Valley of northern Italy

THE Italian Government is reorganizing state-owned oil and gas operations under a new agency, Ente Nazionale Idrocarburi (E.N.I.).

E.N.I. was created under a law enacted earlier this year and only recently promulgated. It has been given monopoly rights on future exploration and development in the entire Po Valley in northern Italy.

The provisions of Law No. 136 have killed any hope that the Italian Government might open up the Po Valley to work by private companies, Italian or foreign. The new state organization has been given exclusive rights to explore for and develop hydrocarbons, construct and operate pipe lines, and develop geo-thermic steam resources.

Exploration and development in Italy has heretofore been governed by a royal decree-law passed in 1926 during the Mussolini regime. This favored operations by the government's Azienda Generale Italiana Petroli. Since the war, A.G.I.P. has carried on a major gas-development program in northern Italy with what many observers believe to be a considerable degree of success.

While private-company work was not forbidden, the foreign operators considered the terms of the 1926 law unworkable, particularly in that there was no guarantee of a producing lease after successful exploration. The result has been that A.G.I.P. has moved ahead while private companies remained more or less at a standstill. A.G.I.P. now accounts for about nine-tenths of the total gas production in the Po Valley.

The new law sets out the boundaries of the Po Valley, including an offshore area in the Adriatic Sea, and declares this the exclusive province of E.N.I. The legal situation is unchanged elsewhere in Italy, including Sicily which has a separate law under its regional automomy. E.N.I. is authorized to work outside the Po Valley on a commercial basis, although it does not have monopoly status.

Government under pressure . . . The new E.N.I. law is the outgrowth of discussions which have been under way in Italy for several years. The government was under strong nationalist pressure to favor exclusive state operations. Geologically, the Po Valley is one of the most attractive prospects in Europe, and several foreign companies would probably have initiated programs had workable legislation been passed. Among these is Standard Oil Co. (N. J.), which, through an affiliate, Soc. Petrolifera Italiana, has a minor amount of crude production in northern Italy.

E.N.I. will function as a holding company, and actual operations will be carried out by a number of subsidiaries. E. Mattei, formerly vice president of A.G.I.P., has been appointed E.N.I.'s first president. The managing committee is made up of the president, vice president, and three directors, all appointed by the Italian Government's Council of Ministers.

The controlling 60 per cent of A.G.I.P.'s stock held by the government has been assigned to E.N.I. The remainder continues in two state agencies, the National Institute for Insurance and the National Fund for Social Insurance. E.N.I. also is taking over the government's stock in other state oil and gas companies, including Azienda Nazionale Idrogenazione Combustibili (A.N.I.C.) which shares ownership equally with Jersey Standard in the refining company Stanic; Soc. Nazionale Metanodotti, which builds and operates gas lines; and Raffineria Olii Minerali, S. A. (R.O.M.S.A.) which manufactures lubricating oil under an "Energol" license from Anglo-Iranian Oil Co., Ltd. A.G.I.P. owns 51 per cent, and Anglo-Iranian 49 per cent of the stock of the Industria Raffinazione Olii Minerali (I.R.O.M.) refinery near Venice.

Capitalization . . . E.N.I. is being backed by government funds and property amounting to 30 billion lire or about $48,000,000. Half of this is represented by the value of the assets being assigned by the government, including stock in existing government companies and a valuation of nearly $14,000,000 which has been placed on already-discovered oil and gas reserves. The other $24,000,000 is made up of a government grant spread over a period of several years.

E.N.I.'s accounts will be submitted to the Parliament annually. Annual net profit will be split 20 per cent to a reserve fund, 15 per cent for the encouragement of research, particularly in petroleum, and for technical education in this field; and 65 per cent to the government. For the first 3 years, the

government's 65 per cent goes to increasing E.N.I.'s funds.

Operational budget . . . The program which has been set up for the E.N.I. subsidiaries during this and next year contemplates an expenditure on exploration amounting to the equivalent of about $24,000,000 annually. In addition, it is planned to spend about $32,000,000 in 1953 and about $16,000,000 in 1954 on construction of pipe lines and related facilities.

The E.N.I. law provides that rights granted under prior permits and concessions in the Po Valley will be respected. This includes pipe lines now being operated by private interests. The existing permit holders and concessionaires are given authority to construct pipe lines within each single concession and within a radius of 10 km. (6.2 miles) of the area. The law also provides that within a year these concession and permit holders are required to supply any useful geological and geophysical data to the Ministry of Commerce and Industry.

The Jersey Standard affiliate, S.P.I., holds exploration permits over scattered areas mostly in the eastern part of the Po Valley totaling about 55,000 hectares. These permits have been renewed periodically in hope of a more favorable legal situation. Aside from its small existing production, S.P.I. is virtually inactive. Some of its rigs have been rented out to Italian interests and are being used for exploratory drilling in southern Italy and for drilling underground-steam wells.

Petrochem Plant Started

A large plant is being built in Hungary in the region of the Tiszalok power project to process natural gas piped into Hungary from Rumania. The pipe line will be laid by a Hungarian-Rumanian company, but the Hungarian petrochemcal plant, foundations of which were laid in June 1952, is being built by that country alone.

Power will be supplied by the Tiszalok project, and the large quantities of water required will come from a reservoir made available. Preliminary construction work is in progress this year, but the main plant will not begin operation until 1955.

Sulfur Output Gaining

A total sulfur production from oil-industry operations of about 90,000 tons annually is anticipated when various recovery plants planned and under way are completed in western Europe.

The Petroleum Information Bureau in London reports that sulfur plants built in connection with oil refineries in the United Kingdom will be producing at a rate of 22,000 tons annually by the middle of this year. One 10,000-ton plant is in operation, while another of 12,000-ton capacity is due for completion in June. A third, of somewhat smaller capacity, will be finished next year.

These and similar plants planned in other European countries provide a total sulfur output of 56,000 tons from refineries in western Europe. Other sulfur recovery is from hydrogenation and shale-oil operations. The scheduled 90,000-ton total western European production will meet nearly a tenth of the estimated sulfur requirements which have been estimated at about 1,000,000 tons in 1955 for the countries in the Organization for European Economic Cooperation.

Equipment Sales Gain

Orders for oil equipment and materials placed with British supply companies during the first quarter of 1953 amounted to $56,353,680 (£20,115,600).

On an annual basis, this represents a reduction from the $255,921,680 (£91,400,600), total value of orders received during 1952. Principal categories in the first-quarter orders were tubulars, fittings, and valves, £3,006,000; drilling and production equipment, £2,571,500; automotive equipment £1,877,300; drums, drumsheets, and tinplate, £1,773,600; bulk chemicals, £1,655,700; and electrical equipment, £1,633,100.

The figures on British equipment orders are compiled by the Oil Companies Materials Secretariat in London and released by the Council of British Manufacturers of Petroleum Equipment.

Products Imports Drop

Large-scale refinery construction carried out in Britain the last few years produced the first substantial drop in United Kingdom imports of refined products in 1952.

Products imports fell during the year by approximately 82,100 bbl. daily The drop was a decline of 38.2 per cent. Motor-fuel imports were down 50.1 per cent compared to 1951; gas oil, 46.5 per cent; fuel and diesel oils, 40.9 per cent; and kerosine, 19.2 per cent. Imports of lubricating oils showed no significant change.

In contrast, crude oil imports rose sharply to meet the charge requirements of the new and enlarged refineries. Total imports of crude and products into the U.K. last year reached a record of just over 593,000 bbl. daily, and of this, about 466,000 bbl. daily was crude oil, a gain of 38.6 per cent.

Increase in total imports represented a gain of about 48,300 bbl. daily, or 8.8 per cent. Although this total was a new record, the gain was appreciably less than in 1951 when total imports, crude and products, increased 37.7 per cent over 1950.

Total value of the United Kingdom's imports of both crude and products was nearly $940,000,000. This was a 11.5 per cent increase by value over 1951 imports.

AFRICA

Plant Work Progressing

The South African Government's coal-synthesis plant is expected to go into operation the middle of next year provided deliveries of overseas equipment proceed on schedule.

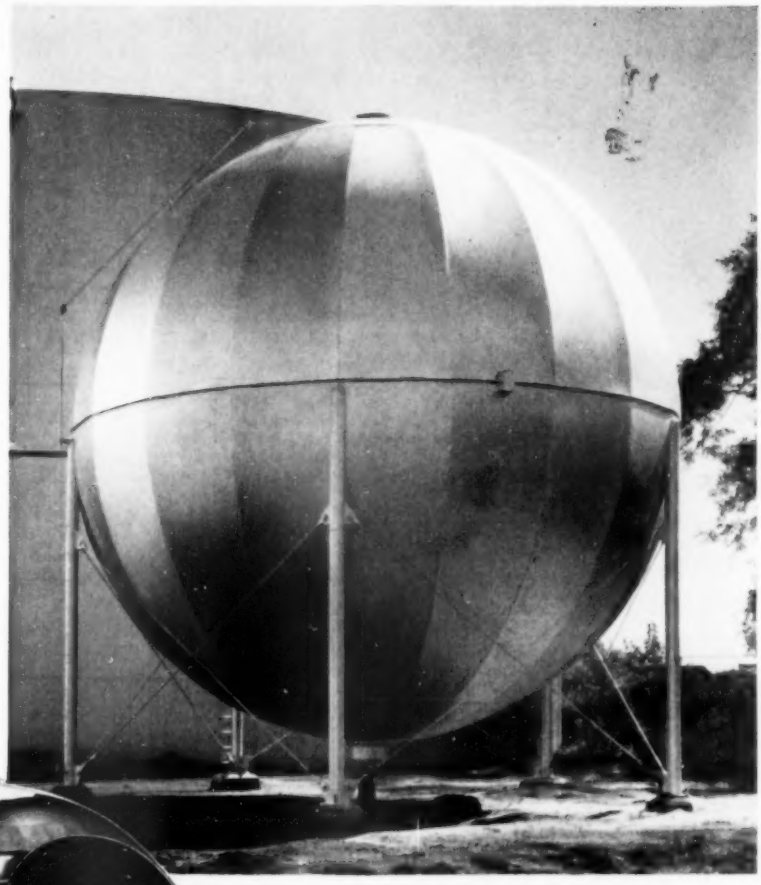
The government company, South African Coal, Oil & Gas Corp., Ltd., SASOL is building the plant near the town of Coalbrook about 40 miles south of Johannesburg where large coal reserves lie close to the surface.

The entire project includes the opening of virgin coal deposits, construction of above-ground gasification facilities to transform coal to synthesis gas, and the complete synthesis plant to produce liquid hydrocarbons. Over-all project manager is the M. W. Kellogg Co. Equipment is being brought from several countries in Europe, particularly Germany, as well as from the United States.

Production of the plant will be about 4,700 bbl. daily of motor fuel, 400 bbl. daily of diesel oil, and 300 bbl. daily of fuel oil. In addition the plant is expected to yield 9,000 tons a year of ammonia gas, 6,000 tons of tar acids, 3½ million gallons (Imp.) of ethyl alcohol, 2½ million gallons of propyl and butyl alcohol, 1 million gallons of a mixed stream of methanol, acetone, and acetaldehyde, with 2,300 tons of butane and propane, and 14,000 tons of paraffin waxes (half this amount the crystalline type).

South Africa's first oil refinery is expected to come on stream early next year, probably a few months before the anticipated completion of SASOL. This is the 15,600-bbl.-daily refinery under construction at Durban on the East Coast by Standard-Vacuum Oil Co., long a leading marketer of products in the country.

look INSIDE the Horton Vaporsphere*



Top: View of 20,000-cu. ft. Vaporsphere, 34-ft. diam. built for American Coal Company, East Hartford, Connecticut. Above: Cutaway view of Horton Vaporsphere.

to find out why it reduces evaporation losses

Inside the shell of the Horton Vaporsphere there is a flexible hemispherical membrane, the outer edge of which is attached to the shell at its equator. When the Vaporsphere is connected to the vapor spaces of one or more fixed-roof tanks, any vapor that is forced out of the tanks—either by breathing due to increased temperature or by displacement caused by filling—flows through the connecting vapor line into the Vaporsphere and is stored under the membrane. This vapor returns to the tanks when the condition which caused its displacement is reversed.

Complete details on Horton Vaporspheres may be obtained by writing our nearest office. There is no obligation on your part.

**Trade Mark Registered in U. S. Patent Office*

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Atlanta, 3 ..... 2154 Healey Bldg.
Birmingham, 1 ..... 1536 North 50th St.
Boston, 10 ..... 1025-201 Devonshire St.
Chicago, 4 ..... 2128 McCormick Bldg.
Cleveland, 15 ..... 2201 Midland Bldg.
Detroit, 26 ..... 1514 Lafayette Bldg.
Havana ..... 402 Abreu Bldg.
Houston, 2 ..... 2119 C & I Life Bldg.
Los Angeles, 17 ..... 1523 General Petroleum Bldg.
New York, 6 ..... 3347—165 Broadway Bldg.
Philadelphia, 3 ..... 1615—1700 Walnut Street Bldg.
Pittsburgh, 19 ..... Alcoa Bldg.
San Francisco, 4 ..... 1554—200 Bush St.
Seattle, 1 ..... 1325 Henry Bldg.
Tulsa, 3 ..... 1606 Hunt Bldg.

REPRESENTATIVES AND LICENSEES

Horton Steel Works, Limited, Fort Erie, Ontario, Canada
Ateliers et Chantiers de la Seine Maritime, Paris, France
Constructions Metalliques de Provence, Arles-sur-Rhone, France
Chicago Bridge & Iron Company, Ltd., Apartado 1348, Caracas, Venezuela
Comprimo, N.V., 21, Amstel, Amsterdam (C), Netherlands
Compagnia Tecnica Industria Petroli, Rome, Italy
Wheatsoe, Limited, Darlington, England
Motherwell Bridge & Engineering Company, Limited, Motherwell, Scotland
Sociedade Chibridge de Construcoes Ltda., Av. General Justo, 275, Grupo 306, Rio de Janeiro, Brazil

The World Enterprise, One of the Largest

One of the biggest tankers now afloat is the World Enterprise, a 32,500-ton vessel built in England by Vickers-Armstrongs for the fleet of the Stavros S. Niarchos organization. The tanker was recently sent to sea for trials. It is 663 ft. long and has a loaded draft of 34 ft., 5 in.

MIDDLE EAST

Tanker Returns

Japanese vessel loading second cargo at Abadan

THE Japanese tanker, Nissyo Maru, has arrived at Abadan to take on its second load of nationalized Iranian oil.

Flowers and bouquets were showered on the decks of the 18,774-ton vessel after it made fast to docks adjacent to the refinery. The ship was scheduled to load a cargo of about 125,000 bbl. of products and return to Japan.

It is highly doubtful, however, that the Nissyo Maru will be about to make any more trips for Iranian oil. After the first cargo was landed north of Tokyo, the Japanese Government indicated it would halt such deals in the future because of protests from Britain.

The Nissyo Maru is controlled by the independent Japanese oil distributor, Idemitsu Kosan. The Japanese Government is cutting off future currency allocations for Iranian oil and has announced it will block any deals by its citizens on a barter basis.

Court decision appealed . . . Anglo-Iranian Oil Co., Ltd., is now appealing the decision of a Tokyo court denying it an order to prevent the sale of the first cargo landed by the Nissyo Maru. Reports in the trade are that the tanker brought gasoline to Japan on its first trip. Although it was bought at a discount from the Iranians, Idemitsu, as far as is known, is not underselling the Japanese market with the material.

The attitude of the Japanese Government toward Iranian oil transactions was reflected in statements made before the Japanese parliament by the foreign minister and the finance minister. They said it would be welcomed if the country could buy oil cheaply but not if such a purchase would cause unnecessary trouble. The policy of the government is to refrain from supporting trade which could damage good relationships with foreign countries.

FAR EAST

Construction Pushed

Stanvac plant at Bombay to start up in July 1954

STANDARD-VACUUM OIL CO. has stepped up the completion date on its new 25,000-bbl. daily Bombay, India, refinery.

When the project was dedicated in ceremonies June 4, William A. Williams, managing director of the refining company, disclosed it is now anticipated that the plant will go on stream in July of next year, about 6 months ahead of the original schedule.

The dedication ceremony was attended by Bombay's governor, and by U. S. Ambassador Allen. The Stanvac refinery is located on a 280-acre site on Trombay Island, about 10 miles from Bombay, and involves an expenditure equivalent to about $37,000,000.

First of three . . . Stanvac's plant will be the first of three new refineries in India to be completed. The other two projects are being undertaken by the Burmah-Shell organization and by Caltex. All these companies obtained guarantees against nationalization and other concessions in agreements with the Indian Government.

Stanvac also is interested in exploratory operations in India. The company ran an aerial magnetometer survey over about 70,000 miles of the Began basin about a year ago and has been studying the results. Negotiations have been under way with the Indian and Pakistan governments in regard to concessions.

AUSTRALIA

Caltex to Buy More Land

The New South Wales government in Australia is taking steps to sell Caltex 264 acres of land it needs to complete the site for its new 21,000-bbl.-daily refinery at Kurnell on Botany Bay south of Sydney.

Special legislation is being introduced to permit the sale of the Crown acreage. Government officials said the company had already obtained 130 acres from private owners and that outright purchase of the Crown land rather than a lease in perpetuity was desired by the company as a matter of policy of its shareholders.

The refinery will be built and operated by Australian Oil Refining, Ltd., a Caltex subsidiary, and is expected to go on stream before the end of 1955.

International Briefs

A 32,000-ton tanker has been ordered by Caltex Oceanic, Ltd., from a Dutch shipyard at Schiedam in the Netherlands. The vessel, having a length of 201.17 m. or about 660 ft., will be the largest tanker ever built in the country.

A wildcat well is being drilled in southern Styria in southeastern Austria by the Richard van Sickle interests. The test is near Perbersdorf in an area where German operators reportedly had encouraging results in tests during the war. The van Sickle well is below 1,650 ft.

Construction work on the new 100,000-bbl.-daily refinery of Anglo-Iranian Oil Co., Ltd., at Aden has moved from the site-preparation stage to foundation work for the plant itself. First concrete for some of the process units was poured late in May, and piles were being driven to support the stacks of the 22,500-kw. power station. More than 1,300 ft. of the 3,700-ft. stone breakwater protecting the tanker jetties has been laid, and work is moving forward rapidly on the other marine installations.

PERSONALS

Informal Executive

Ex-Consultant Day winding up 30 years with Richfield

THIRTY years ago David E. Day joined Richfield Oil Corp. as a consultant on a 90-day job. He's been there ever since.

Today he is vice president of the company in charge of manufacturing and pipe-line operations.

Back in 1923 Day had been out of college 4 years and was getting his feet on the ground as a consultant when Richfield hired him to design the company's first refinery. With a limited knowledge about refineries, Day came up with a design different from any others then, and there were grave doubts in some minds that the finished plant would work.

But the new plant fired up without a hitch on the trial run, and although things went amiss on its formal opening, Day got all the bugs out within 72 hours and was offered a job as a Richfield refinery engineer.

In 1936 he became assistant to the vice president, and in 1945 he was made a vice president. As such he commands operations of the company's refinery, pipe-line, marine-terminal, economics and statistics, and right-of-way departments.

Day is a home-gardening enthusiast and a domino fan, but he hasn't much time for hobbies, he says. His many responsibilities haven't soured his disposition or formalized his attire. A familiar sight around the Richfield building is Day, in sports ensemble and bow tie, kidding with fellow workers.

Day attended Johns Hopkins University, worked for a while as a roustabout around California's Coalinga fields, and then returned to college. He received a degree in geology from Wisconsin University in 1919, and immediately began a consulting career which ended with his first Richfield job.

Fred A. Deering, vice president in charge of refining at Anderson-Prichard Oil Corp.'s Arkansas City, Kans., refinery, has resigned to devote full time to other business interests. Also, **C. E. Wakefield** of the Arkansas City plant has been named superintendent of the company's Coltex refinery at Colorado City, Tex., replacing **J. C. Bradley,** who will move to Arkansas City in the same capacity.

Charles S. Patterson, geologist in Stanolind Oil & Gas Co.'s Midland office, has moved to Bogota, Colombia, as development geologist for International Petroleum Co., Ltd.

Alvin Shambeck has been appointed president of the newly formed Rocket Petroleum Corp. at Lubbock, Tex. **J. T. Jenkins** is vice president.

Charles E. Wilson, former president of General Electric Co., has been appointed board chairman of Grace Chemical Co.

Jack D. Duren, Shell Oil Co., has been transferred to Glendive, Mont., as exploitation engineer from Houston where he was a member of the company's technical-services group.

Wilson E. Arthur, Los Angeles, and **D. K. Finlayson,** New York, have been appointed assistants to **Charles T. Draney,** vice president of Bechtel Corp. Arthur will have headquarters on the Pacific Coast and Finlayson will be in the company's New York offices.

H. Gordon Calder is resigning as president of Southern Production Co. on July 1 to devote more time to personal interests. He will remain on the company's board of directors and serve as consultant. His successor has not been appointed.

E. L. Krueger has been elected treasurer and a member of the board of directors of Humble Pipe Line Co., Houston, succeeding **C. D. Voss,** who has retired after 34 years of service. Krueger has been secretary and assistant treasurer since 1951, and will continue to serve as secretary.

Roscoe L. Van Zandt has been named superintendent of Lion Oil Co.'s new Barton chemical plant near New Orleans. Others transferred from Lion's El Dorado, Ark., headquarters to management positions at the plant include **Stanley B. Johnson,** assistant superintendent; **John L. Ricks,** chief engineer;

R. L. VAN ZANDT

S. B. JOHNSON

H. Leon Payton, operating superintendent; **Fred B. Elliott,** maintenance superintendent; **Malcolm C. Lowe,** chief chemist; and **Dewey Blackwood,** safety engineer. The Barton chemical plant, costing some $31,000,000, is expected to go into operation during the second quarter of 1954. *(See The Oil and Gas Journal, June 8, page 160.)*

Alex W. McCoy, III, has resigned as assistant manager of exploration for the Tulsa division of Gulf Oil Corp., to become a consulting geologist at Tulsa.

Lee H. Cornell, geologist for Franco-Central Oil Co., has resigned to become an independent consulting geologist. Temporary offices will be at Wichita.

C. T. Ramsey, production engineer for Sunray Oil Corp., has been transferred from Yorktown, Tex., to McFaddin, Tex.

Milan G. Arthur, Union Oil Co. of California, Los Angeles, has been elected chairman of the Pacific Coast district of the American Petroleum Institute Division of Production. He succeeds **T. H. Acres,** Sunray Oil Co., Los Angeles. Other Pacific Coast district officers elected were: **J. T. Ledbetter,** vice chairman, Los Angeles basin, Union Oil Co. of California, Whittier, Calif.; **G. V. Kersten,** vice chairman, South San Joaquin Valley, Western Gulf Oil Co., Bakersfield, Calif.; **Watt Lupton,** vice chairman, Coastal area, Shell Oil Co., Ventura, Calif.; **Jack Lemley,** vice chairman, Coalinga-Kettleman, Standard Oil Co. of California, Avenal, Calif.; **Charles T. Reichert,** treasurer, National Supply Co., Torrance, Calif.; **Mrs. Elsie Edmiston,** sec-

PERSONALS

retary, American Petroleum Institute, Los Angeles; and **Lot Bowen,** Western Gulf Oil Co., Los Angeles, chairman of the district advisory committee.

Russell S. McFarland, Dallas, has been elected president of Seaboard Oil Co. of Delaware, succeeding **John M. Lovejoy,** New York, who has been appointed board chairman and chief executive officer. McFarland formerly was executive vice president in charge of operations in the United States and Canada. **James P. Gasser,** Dallas, has been elected to the post vacated by McFarland. Gasser came to Dallas 2 years ago from California as a vice president and assistant to McFarland.

Dave Dunn has been elected president of the Roswell, N. M., Geological Society. Other new officers include **Ed Matchus,** vice president, and **Bob Williams,** secretary-treasurer.

Leslie C. Beard, Jr., assistant director of Socony-Vacuum Laboratories of Socony-Vacuum Oil Co., Inc., New York, has been nominated for a 1-year term as president of the American Society for Testing Materials. **Claire H. Fellows,** director of the engineering laboratory and research department of the Detroit Edison Co., Detroit, has been nominated for a 2-year term as vice president. Official notice of the election of officers will be given at the organization's annual meeting June 28-July 3 at Atlantic City.

R. G. Tribble has been appointed division petroleum engineer for the newly created Gulf Coast division of Cities Service Oil Co.'s production division. He has been district engineer at Houston since last year. **John Forsyth,** petroleum engineer at Columbus, Tex., will succeed Tribble. **Donald Hewitt** has been transferred from Odessa to Brownfield, Tex., as an engineer in the new district offices there.

M. F. Miller has been appointed manager of operations for the Richmond, Calif., refinery of Standard Oil Co. of California. Prior to his new assignment he was assistant manager of the operations-control division of the company's manufacturing department at San Francisco. Succeeding Miller will be **J. S. Detweiler,** who has been technical assistant in the operations-control division at San Francisco. **T. M. Sheehy,** formerly assistant superintendent of the light-oil division at the El Segundo refinery, has been appointed assistant manager of the same division.

Tyler A. Ferguson, division engineer for Transcontinental Gas Pipe Line Corp. in Atlanta, has been promoted to district superintendent at Alexander City, Ala.

W. B. Dumas, seismic party chief for Kerr-McGee Oil Industries, Inc., has been transferred from Sherman, Tex., to Philip, S. D.

E. B. Snell has resigned from Anschutz Drilling Co. where he had been in charge of drilling operations and all contact and contract work for the past 3 years.

Lawrence A. Goebel, formerly assistant division geologist for Carter Oil Co., has been named head of the newly formed development department of Crow Drilling Co., Inc., Shreveport.

E. E. Marshall has been promoted from assistant district superintendent for Humble Oil & Refining Co. at Conroe, Tex., to district superintendent at Livingston, Tex.

T. S. Whitis, vice president in charge of transportation with West Texas Gas Co. at Lubbock, Tex., has been named to the same position with an affiliated company, Amarillo Oil Co., in Amarillo, Tex.

J. P. Straight has been named division superintendent at the newly created Gulf Coast division oil production office of Cities Service Oil Co. (Del.) at Houston. He has been assistant division superintendent for East Texas and the Gulf Coast since 1943. **E. Y. Wilder,** district superintendent at Columbus, Tex., since 1945, has been appointed district superintendent of the new district office at Brownfield, Tex. **D. S. Bodie,** formerly production foreman at Snyder, Tex., has been named to succeed Wilder at Columbus.

Keevil L. Brown has been promoted from production foreman to assistant district superintendent for Magnolia Petroleum Co.'s Healdton, Okla., district. Other Magnolia changes include: **Grayson C. Smith,** senior petroleum-engineering assistant in the Kermit, Tex., district, appointed production foreman in the Healdton district; **Frank N. LeDoux,** promoted from driller to marine drilling-tools foreman in the Louisiana-Gulf division; **Louis M. Ayers,** district superintendent of the Louisiana-Gulf district, transferred to Socony-Vacuum Exploration Co. at Calgary, Alta.; **Cecil M. Rhodes,** promoted from production foreman to assistant district superintendent in the Louisiana-Gulf district at Morgan City, La., and **William Coonan Dougherty,** appointed assistant superintendent of the Brownfield, Tex., district.

Richard E. Lauterbach has been named manager of the manufacturing department of General Petroleum Corp. at Los Angeles. Since last November he has been manager of General Petroleum's new Ferndale, Wash., refinery which is now under construction. He has been with the company since 1936.

John Dlugos, a Canadian Gulf Oil Co. engineer, has been transferred from Calgary, Alta., to Chase, Kans.

H. O. Stallings, reservoir engineer for Richardson & Bass, has been transferred from Kermit, Tex., to Fort Worth.

Steven H. Harris and **James L. Brown** have opened offices at Bismarck, N. D., as consulting geologists.

R. O. RHOADES

Ralph O. Rhoades, vice president of Gulf Oil Corp. since 1951, has been placed in charge of the company's world-wide exploration and production activities. He succeeds **Dr. K. C. Heald,** his former chief in the production department, who recently retired. Rhoades will continue to make his headquarters in Pittsburgh.

W. J. Bramblett, Columbia Southern Chemical Corp., has been elected president of the Houston Chemical Club. Other officers are: **J. L. Pickens,** Mathieson Chemical Corp., vice president; **S. S. Emison,** Consolidated Chemican Industries, Inc., secretary-treasurer; and **Joe W. Russell,** Texas Solvents & Chemical Co., assistant secretary-treasurer. Directors are: **J. C. Wheeler,** Dow Chemical Co.; **J. W. Kennady,** Diamond Alkali Co.; **A. W. Arnold, Jr.,** Arnold & Clarke Chemical Co.; **R. C. Collins,** Stauffer Chemical Co.; and **Ed R. Lett, Jr.,** Allied Chemical & Dye Corp.

PERSONALS

Edward M. Robbins, Jr., has resigned as a geologist for Billings Geological Service to do geological consulting work at Billings, Mont.

Frank Purdum, of Subsurface Engineering Co. and Wright Petroleum Laboratories, Tulsa, is en route to Kuwait Neutral Zone on a special assignment for American Independent Oil Co., San Francisco. He will visit other oil-producing areas before returning to the United States in July.

Howard J. Philip has been promoted to assistant manager of Ethyl Antiknock, Ltd., Ethyl Corp.'s Canadian subsidiary which has its headquarters in Toronto, Ont.

Claude M. Murray, Jr., has joined Fraber Oil Co., subsidiary of Lucey Products Corp., in connection with its production and exploration activities. He recently completed a tour of duty with the U. S. Air Force at Wright-Patterson Air Force Base, Ohio, where he was engaged in petroleum research.

A. S. C. Hulton has been appointed general manager of marine administration for Anglo-Saxon Petroleum Co., Ltd., London. He has been associated with Shell affiliates since 1936 and in 1951 became a vice president of Shell Oil Co. in charge of transportation and supplies. He recently has been on special assignment in Shell's New York office.

Wilbur T. Shinholser, vice president and chief engineer for Ohio Fuel Gas Co., Columbus, Ohio, will move to Washington, D. C., July 1 as a vice president of Columbia Gas System Service Corp. He will assist in coordination of activities of all Columbia Gas System companies in regulatory matters before the Federal Power Commission. **Paul W. Rogers** has been named to succeed Shinholser as chief engineer for Ohio. Rogers has been assistant chief engineer since February 1952.

J. D. Tufts, formerly superintendent at the Destrehan, La., refinery of Pan-Am Southern Corp., New Orleans, has been appointed general superintendent. Other appointments include: **R. L. Argus,** assistant superintendent, appointed superintendent of maintenance and construction at Destrehan; **C. W. Brackin,** chief process engineer, appointed process superintendent at the refinery; **E. S. Chelchowski,** assistant process superintendent, transferred to the general office as senior staff engineer in the manufacturing department; and **J. R. Tusson,** senior staff engineer, transferred to Destrehan as chief process engineer.

William B. Quesenbury, Jr., has been transferred from Midland, Tex., to San Antonio as petroleum engineer for Monterey Exploration Co.

Franklin T. Bethel, junior exploitation engineer with Shell Oil Co., has been transferred from Centralia, Ill., to Houston.

J. A. Hayes, Jr., division geologist for National Associated Petroleum at Denver, has been transferred to the company's Tulsa office as chief geologist.

Frank M. Perry, Bartlesville, Okla., Cities Service Oil Co., has been appointed to membership on the National Petroleum Council by **Douglas McKay,** secretary of the interior. Perry is the newly elected president of the Natural Gasoline Association of America.

E. J. Whitaker has joined the oil-division staff of Northern Pacific Railway Co. as a petroleum engineer.

K. L. Stillwell, Jr., has been named reservoir engineer for Forest Oil Corp. at San Antonio. He was formerly a petroleum engineer for Texas Petroleum Co., in Caracas, Venezuela.

Karl M. Bausch has been appointed chief electrical engineer in the power division of Bechtel Corp. He formerly was chief electrical engineer in the refinery division.

Charles O. Childress, petroleum engineer for Magnolia Petroleum Co. at Houston, has been promoted to district petroleum engineer in the Chase, Kans., district. His headquarters will be in Great Bend, Kans. **Harold E. Schwartz, Jr.,** district petroleum engineer in the Chase district, has been transferred to the Kansas division office at Wichita as senior petroleum engineer. **James T. Rosenberger** has been promoted to assistant district superintendent of the El Dorado, Kans., producing district.

DEATHS

Charles Cunningham, 80, Kiefer, Okla., retired driller, died June 3 at a Sapulpa, Okla., hospital.

Carl V. Schlaet, San Diego, Calif., executive of Texas Oil Co. who spent considerable time developing Mexican oil fields for the concern, died recently.

B. F. Riggs, 72, retired gasoline-plant superintendent for Amarillo Oil Co., died recently in Denver.

George Waters Sands, formerly assistant treasurer and assistant secretary of Barber Oil Corp., New York, died June 2 at his home in Cranford, N. J. He had been with the firm 41 years, and retired 2 years ago.

Marion (Bill) Rutledge, 52, engineer for Tide Water Associated Oil Co., died recently at Long Beach.

Theodore J. Fitch, 82, pioneer oil pipe-line builder and former vice president of Magnolia Pipe Line Co., died recently in Rogers, Ark. He worked for various pipe-line companies before becoming an independent operator in the pipe-line and oil-drilling fields in 1905. He joined Magnolia in 1911 and was named vice president in 1932.

Leo Ray Sweetapple, 71, who served as field foreman for Pat Oil Co. until his retirement in 1950, died recently at Bradford, Pa.

Dr. Ferdinand Sonneborn, 79, New York and Petrolia, Pa., a founder and president of L. Sonneborn Sons, Inc., oil refining and chemical manufacturing company, died June 9 at New York. He came to this company from Germany and established the company with his brother, the late Siegmund Sonneborn. He was active in many phases of research relating to pharmaceutical and industrial derivatives of petroleum.

Frederick Driehs, 79, first general foreman of the refining division of Magnolia Petroleum Co.'s Beaumont, Tex., refinery, died at Beaumont recently. Driehs came to Beaumont in 1903 and helped build the George A. Burt refinery, predecessor of Magnolia's refinery. He retired in 1938.

Edward Lee Roark, 54, independent consulting geologist, died June 9 in Tulsa. He worked for the old Marland Oil Co., Wynona Oil Co., and other firms before becoming a consultant about 5 years ago.

Millions of Barrels More Oil For Healdton Field

by C. H. Riggs* and John E. Wey*

HEALDTON oil field has been one of the most prolific oil-producing areas in Oklahoma. Cumulative oil production to January 1, 1951, from 7,142 productive acres of Healdton sand is more than 211 million barrels. This averages 29,570 bbl. of oil per acre, and 410 bbl. per acre-foot. Oil recovery from several leases was greater than 120,000 bbl. per acre. With few exceptions, this oil has been recovered by primary-production methods utilizing the natural energy of the reservoir fluids.

Between 1926 and 1950, an additional 20,198,000 bbl. of oil, over and above that expected by normal production methods, was produced as a result of additional drilling, deepening, cleanout, vacuum application, and gas injection.

The estimated normal decline rate between 1926 and 1950 was 7.7 to 5.0 per cent per year. During this period it is estimated that approximately 285,000 bbl. of additional oil was gained by the injection of air and gas into the Healdton sands. The remaining 19,912,600 bbl. of additional oil recovery is attributable to the drilling of new wells, deepenings, cleanouts of oil wells, and vacuum application.

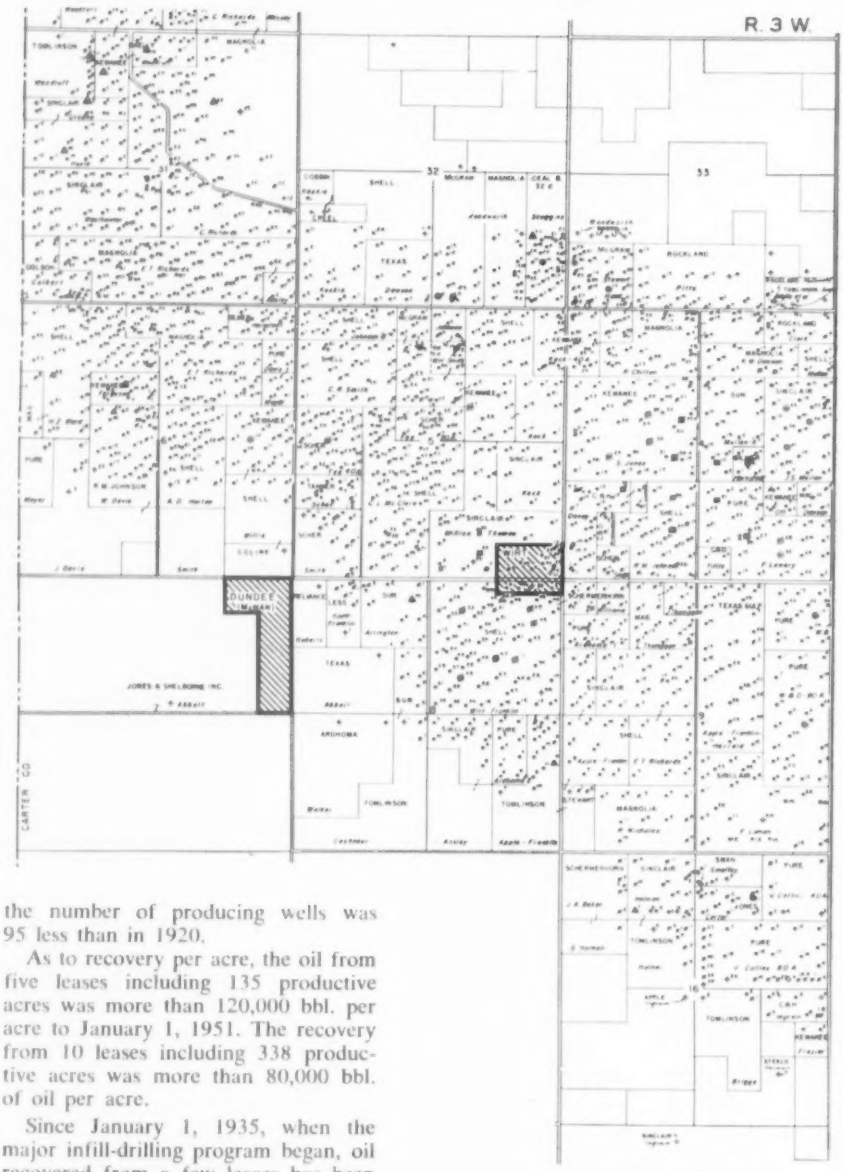
Between 1925, when annual oil production was 5¼ million barrels, and 1950, when it was 2¼ million barrels, a total of 88½ million barrels of oil was recovered from Healdton sands. During this interval the over-all decline rate was less than 3½ per cent per year—much lower than that of most fields of comparable age. Additional drilling, deepening of wells to new sands, and cleanouts of old wells have sustained this oil-production rate. Very little is attributable to gas-injection operations.

Although 440 new wells have been drilled in Healdton oil field during the last 25 years, it is interesting to note that at no time since 1920 has the number of producing wells equaled the number of wells (1,971) which were producing at that time. The number of wells abandoned exceeded the number of new wells completed and in 1950 the number of producing wells was 95 less than in 1920.

As to recovery per acre, the oil from five leases including 135 productive acres was more than 120,000 bbl. per acre to January 1, 1951. The recovery from 10 leases including 338 productive acres was more than 80,000 bbl. of oil per acre.

Since January 1, 1935, when the major infill-drilling program began, oil recovered from a few leases has been nearly 40,000 bbl. per acre, and from most of the leases in the main part of the field has been nearly 20,000 bbl. of oil per acre. Oil recoveries in the southeast extension are much lower.

Infill drilling . . . A comparison was made as to the oil recovery, between 1935 and 1950, from Healdton sands



Map of Healdton oil field, Carter County, Oklahoma, showing location and status of wells and leases. Legend appears at upper right on opposite page. Fig. 1.

*Authors are petroleum engineers, U. S. Bureau of Mines, Bartlesville, Okla.

This United States Bureau of Mines article can be used as a model procedure by engineers and operators everywhere, for investigating other potential water-flood areas. The material here deals with all technical aspects, and constitutes a veritable guide book on the subject.

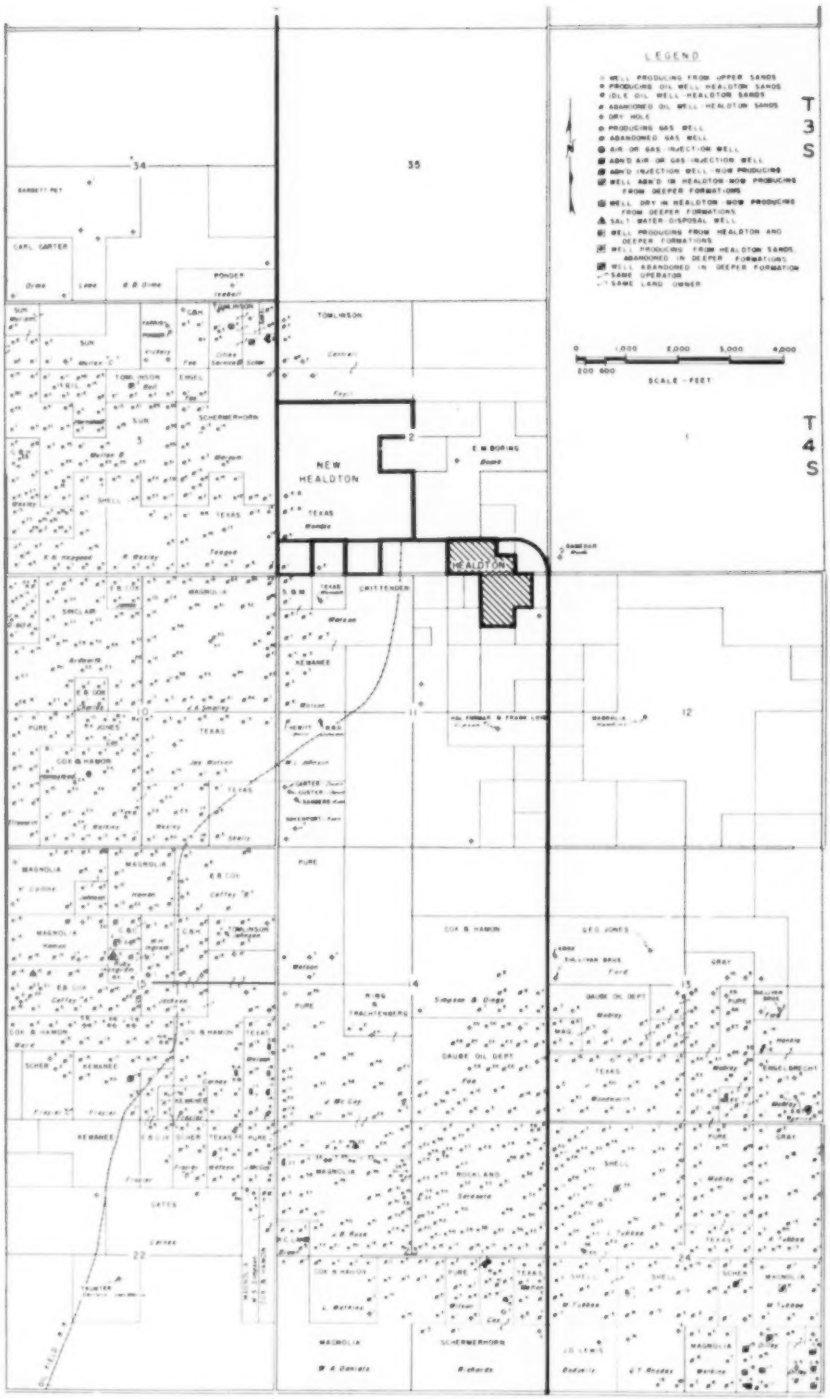
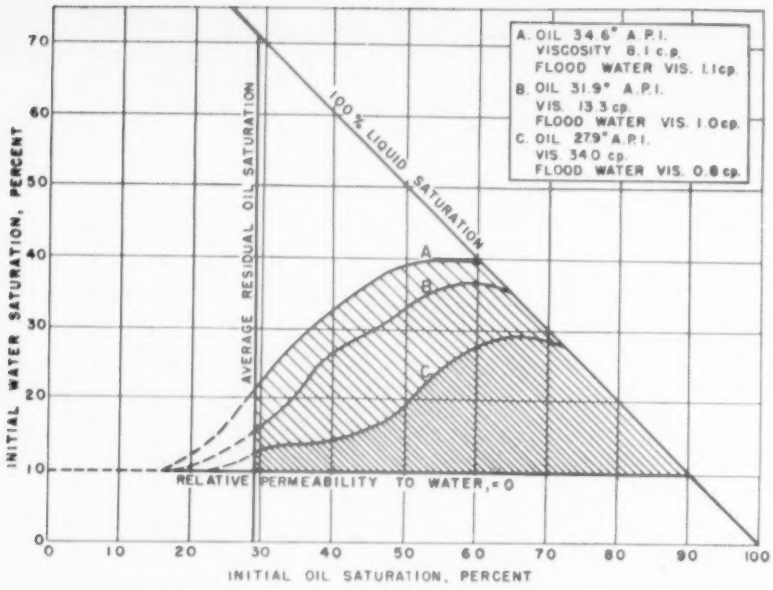


TABLE 1—FIELD AND RESERVOIR DATA, HEALDTON SANDS, HEALDTON FIELD

General	
Date of discovery	Aug. 14, 1913
Depth of wells, ft.	700 to 1,400
Total productive area, acres	7,142
Wells drilled to 11-51	2,590
Wells producing, 11-51	1,863
Stock-tank gravity of oil, °A.P.I.	26 to 35
Viscosity (31° A.P.I., at 80° F.), cp.	13.3
Reservoir Data	
Avg. effective thickness, ft.	72
Avg. porosity, per cent	21.6
Avg. permeability, md.	330
Avg. connate water, per cent	18.2
Avg. orig. reservoir press. (est.), psig.	270
Avg. form. temp. (est.), °F.	80
Gas orig. in solution, cu. ft.	85
Formation vol. factor (est.)	1.044
Original mobile oil reserves, bbl.	422,000,000
Total stock-tank oil originally in reservoir, bbl.	674,195,000
Production Data	
Initial oil production between 1913 and 1917, per well per day, bbl.	270
Max. yearly oil prod., 1917, bbl.	22,036,000
Yearly oil prod., 1950, bbl.	2,263,000
Avg. daily oil prod., 1950, bbl.	6,200
Avg. daily water prod., 1950	14,600
Avg. specific gravity of produced gas (est.)	0.88
Gasoline content of produced gas as of Jan. 1, 1951, gal. per M.c.f.	0.31 to 3.95
Recovery	
Cum. oil prod. to 1-1-51	211,179,000
Oil recovery to 1-1-51, field avg. per acre, bbl.	29,570
Oil recovery to 1-1-51, field avg., bbl. per acre-ft.	410

underlying infill and noninfill-drilled leases. The cumulative oil recovery from 31 infill-drilled leases, including 2,100 productive acres, was increased from 80 million to 105 million barrels between 1935 and 1950 or an increase of 31.2 per cent over their cumulative recovery to 1935.

By contrast the oil recovery from 44 noninfill-drilled leases, including 1,726 productive acres, was increased only 22.2 per cent over their cumulative recovery to 1935. Assuming that without infill drilling, the increased recovery after 1935, normally would be about 22 per cent of the cumulative recovery through that date, then the infill-drilled leases recovered an additional 3,430 bbl. of oil per acre, or 29,500 bbl. per infill well, between 1935 and 1950 by drilling the 244 additional oil wells. In general the infill wells were drilled in the more prolific parts of the field which had lower decline rates. No attempt was made to estimate future oil production from the leases in these two groups.



Limiting initial liquid saturation for successful water flooding of loosely consolidated sands in the Healdton oil field. (After data by Leverett and Lewis.) Fig. 2.

Reservoir Conditions

Oil production is obtained from discontinuous and lenticular Healdton sands of late Pennsylvanian age which range in depth from 700 to 1,400 ft. Apparently these sands were deposited unconformably around and over a topographic high of the eroded Ordovician surface. During Mesozoic time, the area was folded and faulted to form a modified anticlinal structure.

In this study the Healdton sands are considered as belonging to four zones, the uppermost of which is termed the first-sand zone, and the lowermost, the fourth-sand zone.

The first sand, now most nearly depleted, is the thickest and most extensive. The second and third sands are extremely lenticular with alternating beds of sand and limestone of high and low permeability. The fourth sand covers a relatively smaller area, is more uniform in character, but differs from the other sands in the nature of the production mechanism. For the purposes of this report the fourth Healdton zone is considered as a separate reservoir, differing from the three Healdton sands above, in that it is under the influence of a definite water drive. The upper three sands which lack the benefit of this natural water displacement therefore are considered most suitable for water-flood development and will be discussed in more detail.

Thicker Sands to North

An isopachous map drawn to show the total net effective thickness of all oil-productive sands above the fourth sand, including upper sands and stray sands, reveals a range in thickness up to 320 ft. The thicker sands occur throughout the north central part of the field. The thinner sands lie along the edges and in the southeast extension. For individual leases the net average effective thickness of all oil-productive sands, above the fourth sand, ranged from 4 to 177 ft.

In general, the first sand zone includes fine-grained, loosely cemented sand and shaly sand, whereas the second and third sand zones contain more limestone. Several core samples from these sands were analyzed in Bureau of Mines laboratories and the results of measurements on these cores are summarized in Table 2.

Brine saturation . . . Clean cores were saturated under vacuum with formation brine, but in most cases the cores could not be saturated to 100 per cent of the pore volume as determined by gas expansion. The fraction of the total pore volume thus saturated with brine ranged from 0.57 to 1.0, as shown in the table.

Resistivity . . . The resistivity of the brine-saturated core to the flow of an electrical current of approximately 30 ma. was determined, and the ratio between this resistivity and the resistivity of the brine alone at the same temperature (about 78° F.), shown in table as "formation factor."

Connate water . . . The saturating brine was displaced (restored-state method) from the cores with nitrogen at pressures up to 50 psi., and the water remaining in the core is assumed to be representative of the connate water.* The per cent of the pore volume, ranging from 4.3 to 71.7 per cent which remained filled with this connate water is shown.

TABLE 2—LABORATORY MEASUREMENTS ON HEALDTON SAND CORE SAMPLES

Porosity (%)	Perm., md.	Max. brine sat.*	Formation factor†	Connate water‡ (%)	Clay, volume (%)
First Sand					
27.6	260	0.88	8.93	27.8	14.3
20.1	210	0.74	11.07	36.7	13.3
17.1	73	0.78	14.55	38.4	14.8
18.5			15.16		
29.0	4,200	0.76	6.24	11.3	8.4
27.6		0.92	5.77	24.7	
27.0	530	0.77	8.53	15.4	13.4
21.8		0.80	6.37	28.1	24.8
27.8	1,300	0.67	11.44	16.8	9.9
20.8		0.78	9.45	43.6	29.8
19.1	21	0.00	13.10	18.6	20.1
6.9	110	0.94	45.41	34.3	5.5
2.3	0.1	0.81	192.25	71.7	3.2
30.5		0.89	6.24	10.2	5.0
27.2	770	0.81	9.47	14.2	10.5
Second Sand					
24.9	760	1.00	7.71	15.2	4.2
28.6	270	0.73	12.50	14.4	11.3
29.1	740	0.72	11.52	7.1	2.2
11.9	3.7	0.95	34.83	23.8	3.5
20.7	170	0.79	9.55	6.1	4.6
8.7	7.1	0.97	45.72	24.2	4.1
Third Sand					
27.1	450	0.77	10.09	14.8	8.8
27.4		0.77	9.07	12.3	12.5
27.1	2,600	0.89	6.81	13.2	6.9
30.1	2,900	0.94	6.27	8.1	16.5
Fourth Sand					
10.5	0.4	0.62	71.40	56.2	4.5
27.3	870	0.81	7.00	11.9	9.2
30.1	620	0.83	12.60	7.0	
27.7	525	0.87	9.90	7.8	
25.8	630	0.91	10.16	16.3	
28.7	1,200	0.90	8.10	10.0	
27.9	520	0.89	8.90	14.4	
8.5	2	1.00	65.60	32.4	
9.8	9	0.96	56.30	34.3	

*Fraction of pore space; saturated in laboratory under vacuum.

†Formation factor

$$= \frac{\text{Resistivity of core at maximum brine saturation}}{\text{Resistivity of brine}}$$

‡By restored state method, displacement at 50 psi.

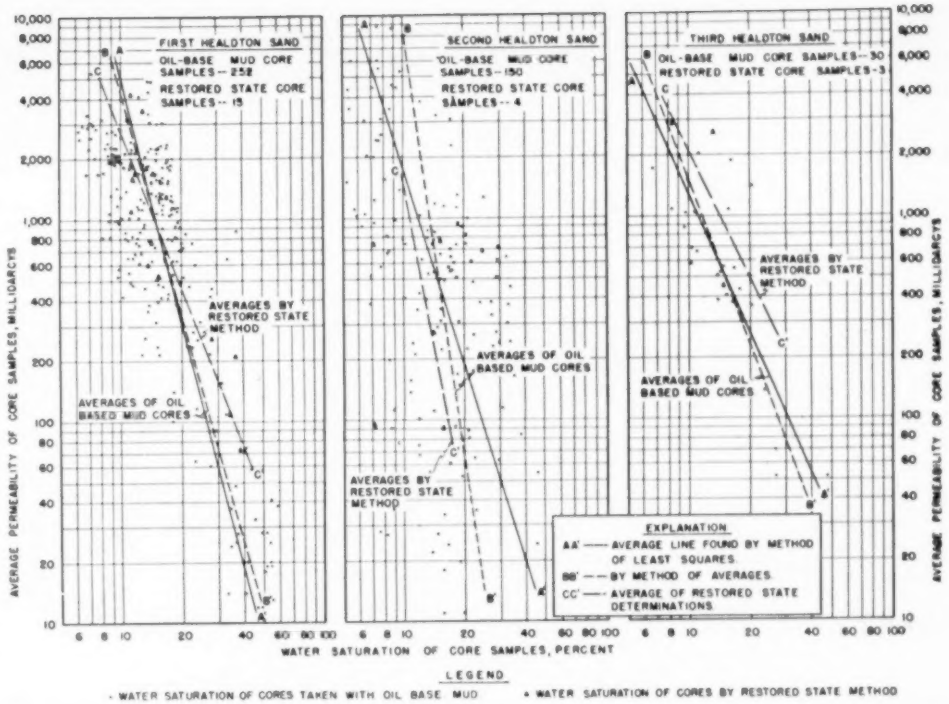
Oil-Water Contact

In the main part of the field no definite oil-water contact has been established in the upper Healdton sands above the fourth sand. Along the edges of the field upper Healdton sands which were penetrated in early wells

*As used in this report the term "connate water" is defined as minimum water saturation: that quantity of water coexisting with oil in a water-wet reservoir rock at initiation of exploitation, and maintained by capillary forces which equal or exceed displacing gravitational forces.

were water-saturated at depths ranging from 110 to 430 ft. below sea level. A study of these data show that the water level follows in general the structural pattern but exhibits less relief. However, the water level was not consistent in depth locally, and many wells produced water-free oil from sands at depths below those of the water-producing sands in adjacent wells. After continued production, the water has become depleted.

Above the oil-water contact and above a transition zone of indefinite thickness the water in the sand is connate water as defined. In Healdton oil field 9 wells were cored with oil-base mud and the connate water saturation was determined on a total of 502 core samples from the several sands. The connate-water saturation of 57 core samples was measured in the Bureau of Mines laboratory by the restored-state method. These data were used to construct graphs showing relationships between permeability and connate-water saturation for the several sands.


FIRST HEALDTON SAND
OIL-BASE MUD CORE SAMPLES--252
RESTORED STATE CORE SAMPLES--15
AVERAGES BY RESTORED STATE METHOD
AVERAGES OF OIL BASED MUD CORES
SECOND HEALDTON SAND
OIL-BASE MUD CORE SAMPLES--150
RESTORED STATE CORE SAMPLES--4
AVERAGES OF OIL BASED MUD CORES
AVERAGES BY RESTORED STATE METHOD
THIRD HEALDTON SAND
OIL-BASE MUD CORE SAMPLES--30
RESTORED STATE CORE SAMPLES--3
AVERAGES BY RESTORED STATE METHOD
AVERAGES OF OIL BASED MUD CORES
EXPLANATION
AA' —— AVERAGE LINE FOUND BY METHOD OF LEAST SQUARES.
BB' — — BY METHOD OF AVERAGES.
CC' —·— AVERAGE OF RESTORED STATE DETERMINATIONS
AVERAGE PERMEABILITY OF CORE SAMPLES, MILLIDARCYS
WATER SATURATION OF CORE SAMPLES, PERCENT
LEGEND
· WATER SATURATION OF CORES TAKEN WITH OIL BASE MUD
+ WATER SATURATION OF CORES BY RESTORED STATE METHOD

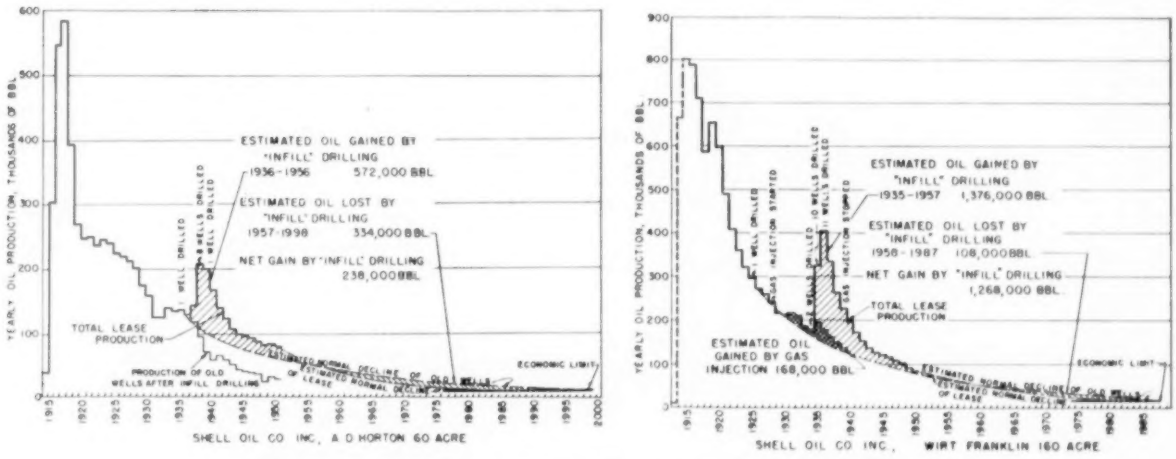
Relationship between connate-water saturation and permeability in the first, second, and third Healdton sands, Healdton oil field, Carter County, Oklahoma. Fig. 3.

It is recognized that permeability is only one of several factors that control the connate-water saturation in the pendent zone above the oil-water contact. The size, shape, and interconnection of the individual pore spaces are important factors. Measurements of grain size, clay, and limestone content, were compared with the measured connate-water saturation to determine what effect these variables might have upon the connate-water saturation as determined by the restored state method, but no conclusions could be drawn from the available data.

In the absence of connate-water saturation values for each lease, relationships shown in Fig. 3 were considered to be applicable to the upper three sands throughout the field. Based upon the relative percentages of first, second, and third sands underlying the several leases and upon an estimated permeability, a weighted average connate-water saturation was assigned to each lease, and used in calculations of the oil originally in place in the sands for each lease.

Reservoir Oil

Above the oil-water contact in the several sands, that portion of the pore spaces not filled with connate water is assumed originally to have been saturated with reservoir oil. As far as can be ascertained no bottom-hole samples of oil from the Healdton sands have been obtained, and definite data as to the original reservoir pressure and


YEARLY OIL PRODUCTION, THOUSANDS OF BBL.
ESTIMATED OIL GAINED BY "INFILL" DRILLING 1936-1956 572,000 BBL
ESTIMATED OIL LOST BY "INFILL" DRILLING 1957-1998 334,000 BBL
NET GAIN BY "INFILL" DRILLING 238,000 BBL
TOTAL LEASE PRODUCTION
PRODUCTION OF OLD WELLS AFTER INFILL DRILLING
ESTIMATED NORMAL DECLINE OF OLD WELLS
ECONOMIC LIMIT
SHELL OIL CO INC, A D HORTON 60 ACRE
ESTIMATED OIL GAINED BY "INFILL" DRILLING 1935-1957 1,376,000 BBL
ESTIMATED OIL LOST BY "INFILL" DRILLING 1958-1987 108,000 BBL
NET GAIN BY "INFILL" DRILLING 1,268,000 BBL.
TOTAL LEASE PRODUCTION
ESTIMATED OIL GAINED BY GAS INJECTION 168,000 BBL
ESTIMATED NORMAL DECLINE OF OLD WELLS
ECONOMIC LIMIT
SHELL OIL CO INC, WIRT FRANKLIN 160 ACRE

Oil production histories of two "infill" drilled leases, Healdton oil field. Fig. 4.

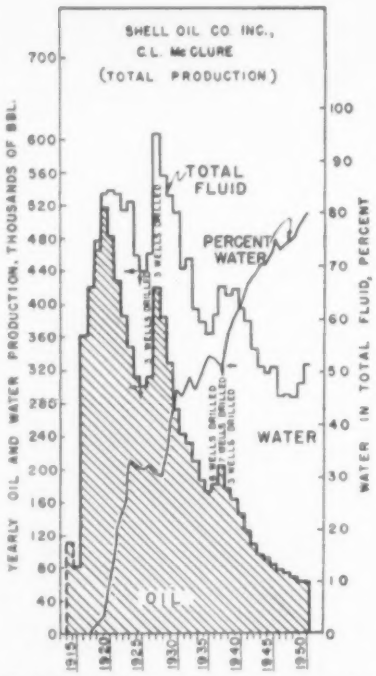
temperature and the quantity of gas dissolved in the reservoir oil are not available. Free, dry gas originally was present above the oil in gas-cap areas throughout the field, indicating that probably the reservoir oil originally was saturated with gas at the initial reservoir pressure and temperature. Early records of gasoline plants showed that the gasoline content of the produced wet gas ranged from 0.28 to 3.3 gal. per 1,000 cu. ft.

Assuming a pressure gradient of 0.4 psi. per foot of depth, the initial reservoir pressures in Healdton oil field would have ranged from 260 psi. at 650 ft. to 480 psi. at 1,200 ft. Reservoir temperatures at these depths, as determined in several wells, would range from 73° to 85° F.

In October 1950, measurements showed that the specific gravity of gas in relation to air ranged from 0.83 to 1.3. Katz[1] has shown that for the average gas gravity of 0.88 and oil gravity of 31.9° A.P.I., 70 cu. ft. of gas per barrel of stock-tank oil would be dissolved in the reservoir oil. Data published by Standing[2] indicates that at 260 psi. pressure and at a reservoir temperature of 73° F. reservoir oil with a gravity of 31.9° A.P.I. would contain about 70 cu. ft. of gas in solution per barrel of oil as measured at stock-tank conditions.

In the deeper zones of the Healdton reservoir with oils of higher specific gravity, it is estimated that approximately 110 cu. ft. of gas per barrel of oil was in solution at about 480 psi. pressure and at a temperature of 85° F.

Assuming an average for the field, it has been calculated that reservoir oil would shrink approximately 4.2 per cent as measured at stock-tank conditions, indicating a formation-volume factor of 1.044. This average formation-volume factor was used to calculate the volume of oil in place, as measured under stock-tank conditions, in the sands throughout the field.



Production histories of a lease with active water drive in fourth Healdton sand, Healdton oil field, Carter County, Oklahoma. Fig. 5.

After deducting for connate water and shrinkage, the original saturation of the upper Healdton sands with stock-tank oil would range from 87.5 per cent of the pore space at 32.0 per cent porosity and 3,000 md. permeability to 36.8 per cent of the pore space at 12.0 per cent porosity and 18 md. permeability.

Nonrecoverable Oil Saturations

By even the most efficient production mechanisms, some oil is left in the pore spaces and termed nonrecoverable. In general it is recognized that oil displacement by water either in a natural water drive or by artificial water flooding is more efficient in reducing the oil saturation to a minimum than is solution-gas drive, gas-cap drive, or gravity drainage.

Cores with oil saturations ranging from 28 to 84 per cent of the pore space were subjected to flooding tests in the laboratory under controlled conditions, and the data available on 19 cores so tested showed that the residual-oil saturation after continued flooding with several thousand pore volumes of water ranging from 9 to 29 per cent and averaged 19 per cent.

No relationship was apparent between residual-oil saturation and other measured properties of the core. In actual practice such high water-oil ratios and complete flooding of the sand would not be economically feasible. In Healdton field most water and oil-producing wells are abandoned when oil constitutes less than 1 per cent of the total produced liquid. Assuming 1 per cent as an economic limit, when the throughput fluid in laboratory tests reached the ratio of 1 volume of oil to 99 volumes of water, the residual-oil saturation of cores ranged from 18 to 45 per cent and averaged 29 per cent.

The mobility ratio of water to oil increases disproportionately with increased water saturation and decreased oil saturation, and at an average oil saturation of 29 per cent, the water-oil mobility ratio and production is in the neighborhood of 99 to 1. At this saturation the remaining oil may be considered as economically immobile or fixed, whereas that oil saturation greater than 29 per cent of the pore space can be considered as mobile and recoverable under the most favorable conditions.

Inasmuch as the porosity and permeability of these 19 core samples covered the complete range of values measured on Healdton oil-producing sands, this figure of 29 per cent was adopted as a reasonable average residual oil saturation. Original mobile-oil saturation ranged from 58.5 per cent of the pore volume for an average sand of 32 per cent porosity, to 7.8 per cent, for the average sand of 12 per cent porosity cited earlier.

The volume of stock-tank oil originally present in the Healdton reservoirs was calculated for individual leases by the following formula:

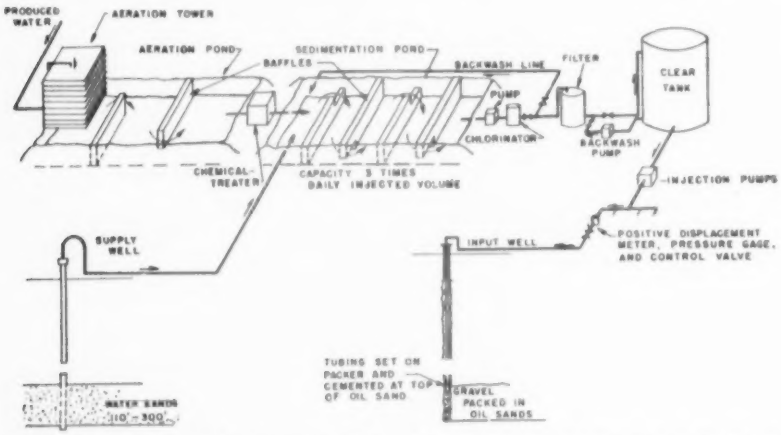
$$S.T.O. = 7{,}758 \times A \times T \times P\,[(1 - C_w)/F.V.F.]$$

where:

S.T.O. = original oil, measured at stock-tank conditions, bbl.
7,758 = conversion factor, acre-ft. to barrels
A = area of sand, acres
T = effective thickness of sand, ft.
P = average porosity of sand, decimal fraction of total volume
C_w = average connate-water saturation, decimal fraction of pore space
F.V.F. = formation-volume factor

Mobile oil for each lease was calcu-

(Continued on page 131)



Flow diagram of suggested water-conditioning and injection system for Healdton field. Fig. 6.

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DRILL-STEM TESTING

by J. L. Fusselman

Basin-by-Basin D.S.T. Conditions

RESULTS of a formation test oftentimes comprise the predominant factor by which management is guided in its analysis of field work, regardless of whether the well is an exploratory or a developmental operation.

Where formation tests are vague, a decision to set pipe or complete in a certain zone will be postponed until a geologist or engineer is called in to review the data. In this case, the use of core analyses and electric or radioactive logging surveys are correlated side by side with the formation test to obtain a sufficient set of facts on which a final opinion may be based.

In the Rocky Mountain region, however, conditions are generally favorable for conducting a successful drill-stem test. Principal sandstone objectives are sufficiently consolidated to permit taking of open-hole tests.

On the other hand, a complexity of geologic and reservoir factors present in the Rocky Mountains present many problems in formation testing. This article discusses how drill-stem tests are conducted under various formation conditions such as soft shale and bentonite beds, in consolidated sandstone reservoirs as well as in fractured dolomites and limestones. Unusual conditions such as hydrogen sulfide gases of high toxicity encountered require special precautions for rig personnel while conducting tests.

Although generally considered as a single province, the Rocky Mountain area is a series of intermontane basins which have received marine and continental deposits, generally sands and shales, to depths of as much as 4 miles. Thick consolidated sands in the Cretaceous produce the bulk of the oil taken from these fields. In recent years, however, important oil reserves have been developed from fractured and vuggy dolomites and limestones found in deeper strata in the Mississippian, Devonian, and Ordovician beds. Thus, different types of reservoirs require different techniques in formation testing for proper evaluation of oil, gas, and distillate contents.

Williston Basin

Full-hole testing has been employed in 90 per cent of the formations evaluated in the Williston basin. Packer sizes are usually 7¾ and 8-in. Frequently, double packers are used. Prior to testing, a circulating time of about 2 hours has been helpful in obtaining a satisfactory test.

Weight set on the packer varies from 16,000 to 20,000 lb. Very little trouble is encountered in working loose from packer seats; however, either mechanical or hydraulic jars are always used in the tool string as a safety measure. Some operators in the Williston basin use a 2,000-ft. water cushion, both as a restriction to flow of fluid into drill pipe, and as a protection for the drill pipe. Straddle tests are not a common practice in this basin.

Most operators use two bombs in the tool assembly with 10,000-lb. springs. Testing tool is exposed to the formation from 2 to 6 hours. Duration of this period is dependent upon the reaction observed at the surface, particularly if the well flows during the test; one operator leaves the testing tool open for 4 hours after the well begins to flow.

Reversing tools and drill-pipe plugs are commonly employed and tankage is made available to receive the reversed flow. Most tests are conducted with a ¼ or ⅝-in. choke. No trouble has been observed due to tool plugging or from lost-circulation material since circulation losses are rare.

Uintah Basin

About 90 per cent of formation testing conducted in the Uintah basin is full-hole work; 8-in. packers are the most popular size employed. Weight set on the packer will vary from 15,000 to 20,000 lb. Double packers are used on 9 out of every 10 tests run. In one-fourth of these tests, it has been found necessary to jar loose using a hydraulic jar with 30 tons of impact in excess of the weight of the drill pipe.

Water cushions are not used in this

(Continued on page 110)

. . . IN THE ROCKY MOUNTAIN REGION

. . . Step-by-Step Basic D.S.T. Procedures

The formation test, whether run in open hole or casing, consists of three phases:

- **planning and preparation**
- **testing**
- **interpretation of results.**

Methods and procedures elaborated are for general conditions; deviations will be explained later in this article. Most of this analysis covers open-hole testing.

1. Planning and Preparation

When a formation test is desired, plans should be made to accomplish the test with the least amount of rig time and expense. Planning the test does not require any great length of time but preparation at the rig can range from a few hours to several days. Planning can mean the difference between a well-conducted test or one that turns into a fiasco, involving fire, damage to rig, prolonged loss of time, or in extreme cases, injury or death to personnel.

(a) Packer and anchor selection . . . Consideration is now given to the zone to be tested, such as picking the packer point and amount of anchor. Whenever an electric log is run prior to a drill-stem test, the further use of a MicroLog can be very useful in picking a packer point. This is especially true in deep tests where failure to get a good packer seat is an expensive difficulty to remedy.

If the length of anchor is such that the jars penetrate in the rathole for any distance, it will be necessary to insure that any drill collars or drill pipe above the tool string do not have an outside diameter exceeding the largest in the string.

Next in importance is packer size which depends largely on hole conditions. Under favorable conditions a packer diameter 1 in. less than nominal test-hole size is a prudent choice. If cavings or tight-hole conditions exist, it is not uncommon to select a packer diameter up to 1½ in. smaller than test-hole diameter.

The number of packers to be used depends on the area. The use of double packers in full-hole testing no longer causes the concern it once did because of the practice of incorporating jars in the tester assembly. In many areas the use of the double packer has been the only method for obtaining a satisfactory test. The use of double packers has become highly popular in open-hole testing of fractured limestones and in the testing of thin Cretaceous sands where it is necessary to seat the packer in a shale or sandy shale bed above.

(b) Test tool . . . Consideration must be given to the type of tool used in the formation test. There are now three types available in this region. One is the disk tool, opened by a bar dropped from the surface. Another is the positive-opening tool which is rotated one-fourth turn to the right at the surface to open. The third is the hydraulic tool opened as a result of the anchor being in contact with the bottom of the hole.

For bad hole conditions the hydraulically operated tool probably affords the greatest chance of success. However, it is not readily available in all areas of the Rockies, in which case the disk-type tool is preferable. When necessary to skid a packer a few feet the bar can be dropped from the surface and, as the tool opens, the drill pipe can be lowered in an attempt to effect a seat. Under favorable hole conditions and hard-formation testing, no difficulty should be encountered in using this type tool (which is opened by rotating the drill pipe at the surface one-fourth turn to the right). Test tool choke size depends upon the yield anticipated in the test and the likely formation pressure. A 5/8-in. or ½-in. opening is the standard used in this region; however, sizes ranging from ⅛ to ⅞ in. are available. In high-pressure gas-distillate tests, it is reasonable to assume that better control and safer testing can be achieved through a smaller tool choke possibly supplemented by a top hole choke.

(c) Pressure and temperature recorders. A company representative should advise the service company as to the proper elements to be used in pressure bombs. It is still the practice to use two bombs. Advantage can be taken by running one bomb with a lower element than the other to obtain more accurate reservoir-pressure data. The bomb with the larger element can be used to obtain hydrostatic head, an important and necessary item of information on a wildcat well.

Bomb elements available in this region are from 1,700 to 14,000 lb. It is important to have a blankoff between the upper and lower bombs in order to conclusively determine whether or not the perforations were open during the test. A maximum recording thermometer should be run on any wildcat well, for the formation temperature should be known if any cementing or plug-back operations are carried out prior to running an electric log. Geothermal gradients vary so widely that the gen-

THE AUTHOR

J. L. Fusselman is assistant manager of Trigood Oil Co., Casper, Wyo., in charge of drilling, engineering, producing, and gas-utility operations. After graduation from Colorado School of Mines in 1942 he served with the Corps of Engineers until 1945 when he was employed by Amerada Petroleum Corp. Fusselman then worked in South Louisiana for 2 years, and after a 2-year period with The Texas Co. in Colorado and Wyoming, he joined Trigood in his present capacity. The accompanying paper was a feature at the A.P.I. spring meeting, Rocky Mountain Production District, held at Casper, Wyo.

eral rule of 60° F. at the surface plus 1° rise for every 100 ft. of depth does not give the reservoir temperature.

(d) Jars and safety joint . . . When the tester is ordered it should be specified whether or not jars and safety joint are to be included. It is recommended that a safety joint be used whether testing in open hole or in casing.

Jars are not always necessary when testing in casing, but are well worth the money when testing in open hole. Selection of jars is important, for the company supervisor must decide whether he wishes to have mechanical or hydraulic jars available for use. The use of hydraulic jars on a wildcat well sometimes is advisable, for unknown conditions make it impossible to predict how much impact will be required to free the packer or tools. Mechanical jars, whose force of impact is set at the surface, are well used in proven areas where it is known that a certain blow is needed to allow the tester assembly to break freely.

A recent development in jars is the nitrogen impact jar which allows the main impact to occur at the point of resistance. It is believed that one packer jarred loose out of 50 times that jars are used in formation testing will pay for the use of the jars during all these tests. This is based on the estimated cost of fishing a tester assembly, assuming only the cost of an average fishing job.

(e) Reversing equipment . . . In making up the tool string, the tester should be advised whether or not a reversing tool is required. Reversing tools have been of considerable aid in reducing fire hazards, as fluid load in the drill pipe can be discharged into a standby tank for accurate measuring as well as thiefing for content. Reversing tools commonly used in the Rockies are of four types.

● The pumpout sub operates on the principle of pumping against the fluid column in the drill pipe so as to build up enough force to shear a brass pin, permitting the opening of ports in the pumpout sleeve. After this is accomplished, direction of the fluid is reversed so the fluid column within the drill pipe can be pushed out by the annulus fluid.

● The second type of reversing tool is called a bar-sub, which contains a sliding sleeve that reveals ports to the annulus upon impact by a bar dropped from the surface. When the sleeve has moved enough to reveal the ports, mud enters and the fluid column equalizes, ejecting the lighter oil and gas from the drill pipe.

● A third type pumpout sub is equipped with two sets of ports. One set permits the annulus fluid to enter the drill pipe when a brass pin is sheared. If it is later desired to pump back through the tool, a ball is dropped which closes the side ports. This may be necessary if the packer is stuck.

● A recent development in reversing tools is the positive-opening tool which is operated by rotating the drill pipe eight turns to the right after having obtained the shutin pressure. This rotation opens ports which allow annulus fluid to enter the drill pipe. In areas where Permian oil is accompanied by hydrogen sulfide, it is recommended that a combination of a positive reversing-tool and a bar-sub be used. It must be remembered that when the bar is dropped, the pump should be running in order to keep up with the mud dropping in the annulus. Closing the control head, after dropping the bar, will allow the pump to catch up with the fluid.

(f) Surface equipment . . . After specifying equipment necessary in the tool string, attention is turned to equipment needed at the surface. Temporary lines should be laid to the pit and secured, taking into consideration the generally prevailing direction of the wind. If a gas horizon is to be tested, it should be determined if gas bottles will be necessary for sampling. Should the test yield oil a 5-gal. sample is desirable, and, if there is water a 1-gal. sample will suffice.

Measurement of gas during a formation test is desirable for data contributing to the opinion on the merits of the horizon being tested. The gas measurements in this region are usually obtained with a pitot tube, orifice well tester, or orifice meter. During the testing of gas zones, measurement of the gas should be made with an orifice meter for greater accuracy, and to provide a chart for permanent record. The use of a separator in tests that are flowing oil or making gas is well worth the expense.

(g) Final preparations . . . The all-important factor to the tool pusher is the condition of the mud and the hole so that chances for a successful test are not in doubt. If the mud is not in condition and the hole is bridging or showing tight spots, then attempting to test in the face of these obstacles is false economy.

A few hours devoted to conditioning mud to assure a test can mean the difference between a trouble-free test and a possible fishing job or hours wasted in jarring the tool string loose. Sometimes it is profitable to spot 15 to 20 bbl. of straight gel mud at the bottom of the hole before pulling out for a test. Another precaution that should be kept in mind before coming out of the hole to put on the test tools is a check of the pipe rams. After getting out of the hole, a check should be made on the blind rams. Again, this procedure depends on the area and known well conditions.

2. Testing

While coming out of the hole, the tester can be making up the tool string on the rig walk. Then, when the pipe is out of the hole, it is necessary only to pick up the various sections and assemble them. Precautions should be taken that each connection is made up securely with tongs. Makeup of the tool string and measurement of the anchor and over-all dimensions should be supervised by both the tool-pusher and company representative. Usually, the tester will have a chart which has a correct diagram of the string; however, if this is not available, a string diagram should be made and all subs and tools calipered.

(a) Descent for test . . . Hole conditions and size of packer are factors influencing the rate at which the test tool is run to bottom. Full-hole testing at too fast a rate of descent may set up a shock wave and break down resistance to circulation losses.

A check for leaks in the drill pipe must be made while going in the hole, either by checking the annulus or placing a piece of paper with a pin hole in it over the drill-pipe tool joint at about every tenth stand. The driller should constantly observe the weight indicator as each stand is lowered, so that the slightest hesitancy due to bridges may be noted.

Often a test is scheduled so that the tool may be opened at daylight. In this event, it is not recommended that the tester assembly be run to bottom and daylight awaited for any great length of time. Conditions for a successful test are greater if the packer is set soon after reaching the packer point.

(b) Bottom-hole procedure . . . Probing for bottom should be carefully done as this will indicate the amount of trouble to expect in seating the packer. If it is necessary to "skid" the packer then, obviously, the hole is not ready for testing. There have been many tests accomplished, however, by skidding the packer to position and depending on sufficient pressure being available so as to clear the perforations.

Before setting the packer and opening the tool, the tool pusher should make sure the crew and rig are in readiness. Fire extinguishers should be in position and persons designated to use them; if steam is available, two steam

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lines near the floor are highly desirable.

Another check should be made to insure that engine exhausts are equipped with either steam or water. The generating plant should be disengaged from the compound, if so hooked up; or, if it is independent should be shut down during daylight tests. All personnel should be completely clothed and wearing gloves and safety hats to minimize injury should a flash fire occur.

Whenever it is doubtful as to fluid content likely to be obtained, or if it is known that oil or gas is to be the result, plans should be made to open the tool, make the test, and come out of the hole during daylight. Precaution must be taken to insure that the derrick man is provided with an escape line.

As a rule the control-head can be assembled on a single joint sitting in the mouse hole. Every connection and union on the test line must be made up tight, so as to prevent a shutdown to repair leaks. The manifold should be equipped with a pressure gage when testing a gas zone, and a temperature reading can be taken to forewarn possibility of hydrate formation.

When all is in readiness to set the packer and open the tool, the tester and company representative should determine the amount of weight to set on the packer, and the tool pusher instructed accordingly. In this region, a weight slackoff of 2,000 lb. per inch of packer diameter is usually satisfactory.

When taking a shut-in pressure with the right-hand-torque-type tool the pipe is raised not more than 30 in.; whereupon, the only weight probably keeping the packer rubber collapses in the hydrostatic head and the friction grip.

Too much weight on the packer will tear the rubber upon unseating and this can cause considerable difficulty in a well that is coring and also circulating mud carrying much lost-circulation material. When this is the case, and the shaker screen is not in use, small pieces of rubber frequently plug circulating ports of the core barrel.

As the tool is opened, the tester will usually watch the annulus to see if the hole is standing full. If the fluid begins to lower, more weight should be added in an attempt to get it to hold. Since the tool is already in the hole, it is worth several attempts to get the packer to hold. In badly fractured formations sometimes the efforts are fruitless.

Often the packer will hold and there is no indication of any fluid entry in the drill pipe as evidenced by lack of bubbles in the bucket where the tester's rubber hose is submerged. If it is suspected that the tool is plugged, opening and closing the bypass or equalizing valve several times will possibly flush the anchor to the point that the reservoir pressure available can kick off the test.

Running a disk valve in subzero weather can sometimes cause trouble as a result of mud freezing in the drill pipe while standing in the derrick. As the pipe is run to bottom, mud thaws and collects on top of the disk valve and, if there is enough, it can create difficulty in getting the tool open.

(c) Test length . . . Assuming that everything is operating satisfactorily and a test is being accomplished, the decision must be made as to how long the tool should be left open. A gas-zone test should be left open until the flow levels off, which will not occur until sometime after the water cushion has been forced out.

A test flowing oil to the surface can be flowed and measured for as long a period as company supervisor thinks it takes to clean up and get a representative flow of clean oil (and as long as conditions remain safe). In this region a minimum test of 1 hour, and a 20-minute shut-in pressure test is the usual practice. A sloughing hole presents a problem in trying to determine the length of time to leave the tool open.

(d) Concluding test procedure . . . When it is time to unseat the packer, the company supervisor and tool pusher must have complete control. The tool pusher knows the strain his pipe can stand and the company supervisor must be ready to make any necessary decisions in the event of trouble. If the tool string will not come loose it is possible that the hole has caved, the packer has too great a friction grip, or the anchor is firmly imbedded in cavings.

Whenever the hole is known to be in good shape and trouble is encountered unseating the packer due to its friction grip, it is thought best to pick up succeedingly greater weights over the weight of the drill pipe and holding the strain to ease the packer loose. Withholding action of the jars in a case like this will aid in preventing the packer being torn up. Before this is done, the equalizing valve is opened to aid in unseating packer.

In sloughing areas, it is sometimes better to pick up 60,000 to 80,000 lb. above the weight of the pipe to allow the initial impact of the jars to hit the string before too much working of the pipe starts any peeling of the hole wall.

If it is the packer that is not coming loose, then the friction grip that was obtained upon seating it with the weight of the pipe and the hydrostatic pressure of the fluid column was probably built up in the first 15 minutes. Therefore, in a good hole that is not sloughing, the duration of the test does not have too great a bearing on how tightly a packer is stuck.

Since the practice of incorporating jars in the tool string is quite common, it is well to have one or two stands of drill collars above the test-tool string with which to jar. It is seldom, in this region, that the jar impact has to be built up to a force greater than 60 tons over the weight of the drill pipe. Steady jarring with 30 to 50 tons over the weight of the pipe will usually suffice.

The trip out with the tester may be uneventful depending on the recovery. If the test was a flowing test, then drill-pipe plugs should be used all the way out for it is not possible to determine when the remaining fluid will unload as a result of agitation from moving the drill pipe.

Upon finding fluid, an accurate determination should be made of the footages and types involved, then written down so as to prevent any future discrepancies. A good mud box is not only essential, but its drain should be connected to the flow line in order that the oil may be carried on out beyond the mud tanks.

Unloading the drill pipe is the most hazardous procedure of the test. Having made sure that the hole is kept full of mud while coming out, a water or steam hose should be kept in readiness to keep the floor clean of oil. For a particularly gassy fluid and highly volatile oil, the side panels of the rig should be removed to permit good crossventilation. As soon as sampling has been completed, the next information needed is the pressure-bomb charts. To speed up reports of the tests it is generally best to pull the tool string up to the bomb cases where they can be unscrewed and the bomb charts removed. As soon as a bomb chart is in the hands of the company supervisor then the results of the test can be interpreted.

3. Interpretation of Results

In order that a decision may be made as to the merit of a zone just tested, it will be necessary to set forth the data accumulated, analyze the pressure data, evaluate the fluid recovery, and apply the accumulated information in making a decision.

(a) Data assembly . . . As soon as the charts are received from the tester, a record of the test data can be started. A suggested form to follow in listing the data and reporting same is given below.

(1) Well name and test number.
(2) Total depth.
(3) Packer point.

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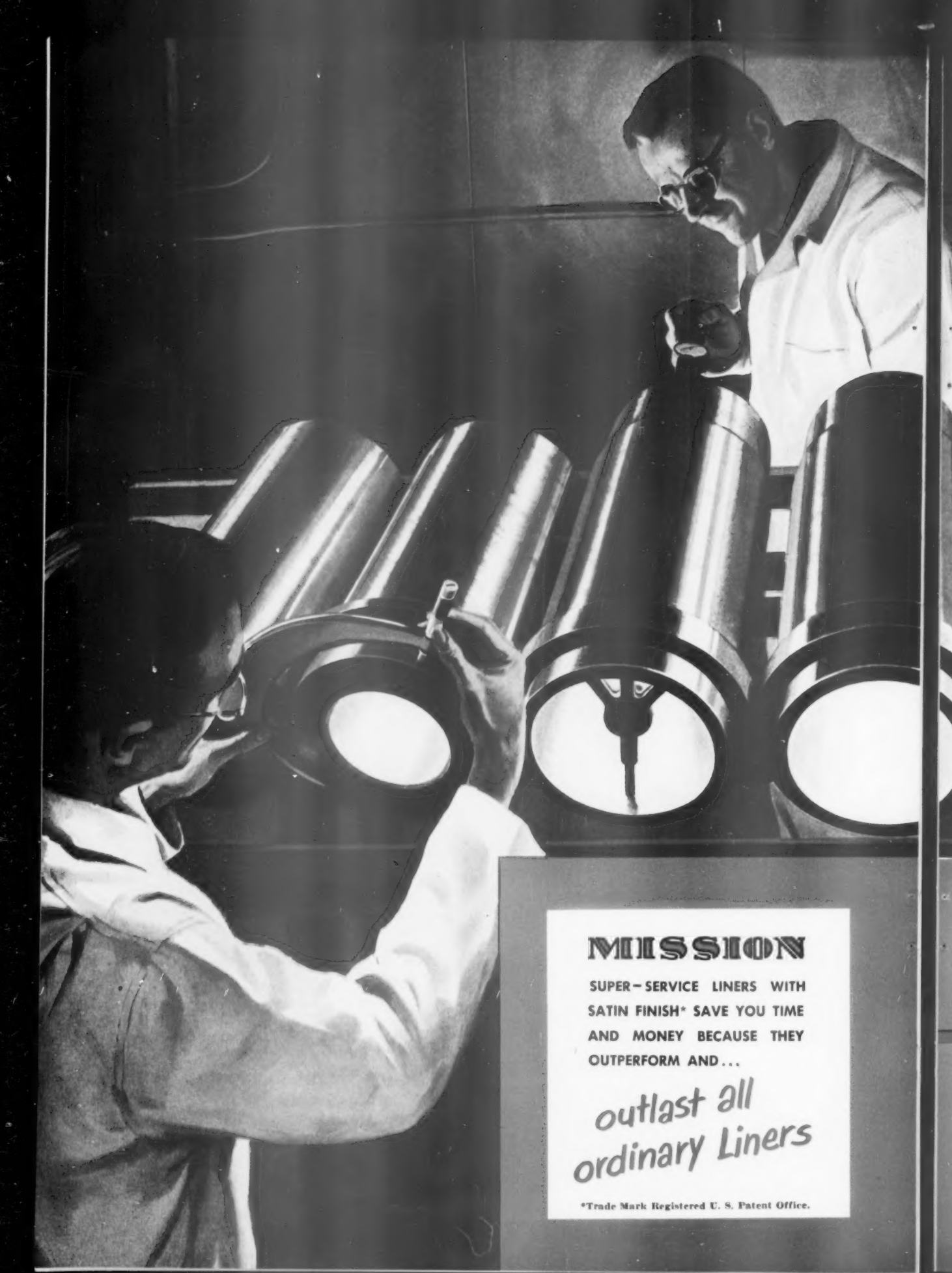
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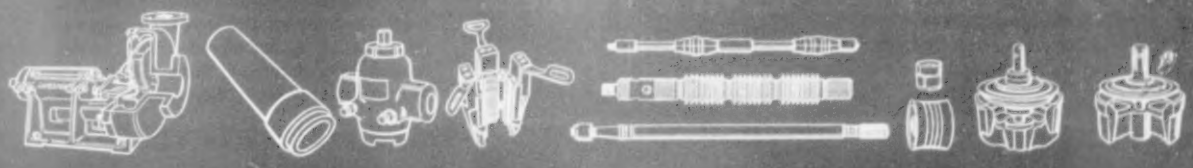

(4) Length of flow period and shut-in period.

(5) Tool choke size, bottom and top.

(6) Size drill pipe or tubing.

(7) Fluid recovery, in feet and A.P.I. barrels per hour, and gravity together with a description of the fluid.

(8) Gas data, time to surface and rate of M.c.f. per day.

(9) Initial and final - flowing, and shut-in pressures.

(10) Surface flowing pressure data.

(b) Pressure-data analysis . . . In wildcat wells, the pressure data will indicate if there is a sufficient differential between the hydrostatic head of mud and the reservoir pressure of a newly found commercial oil or gas zone. If coring was omitted, an indication of good, fair, or poor permeability may be detected from the flowing-pressure curve.

Sometimes an unknown zone in a wildcat well will exhibit slow buildup of flowing pressure and the static pressure will be quite normal indicating that the drainage can be increased by means of nitroglycerin, acid or fluid fracturing.

In pool wells, the pressure data are useful to the petroleum engineer in recommending drainage patterns, detecting possible depletion or replacement mechanisms, and productivity-index calculations. Significant gas-well data can be accumulated by flowing the well at three different rates of flow. The flow period can be judged at the surface by a pressure gage on the manifold and by use of the flow-measuring device. The data accumulated can be used in a preliminary estimate of open-flow delivery capacities of the zone being tested.

(c) Fluid recovery . . . An accurate accounting of the fluid that flows and/or, the fluid that accumulated in the drill pipe or tubing is highly essential to proper interpretation. If oil and water are both present, then an analysis of the water should be made to aid in core-analysis evaluation if it is available. Catching a sample of fluid under pressure is possible even though a regular bottom-hole sampler is not available. This can be effected by putting the shut-in tool a stand above the tool assembly.

Sometimes there will be an indication that retesting is necessary in order to find a water level. This sometimes becomes quite a problem when vertical permeabilities are of large magnitude. Quite frequently fluid-recovery consists of only oil-cut mud yet pressure data indicate a normal shut-in pressure. A decision is necessary here as to whether or not certain production practices can be employed to effect drainage from the main reservoir. Do not forget, however, the possibility of a false shut-in pressure due to tool leak or fluid bypass. Highly permeable or fractured formations can sometimes hide their true ability to produce as a result of high water loss, high-surface-tension drilling mud being literally "stuffed" into the formation or else crevices were jammed with lost-circulation material.

(d) Application of results . . . Having carefully reviewed the meaning of the pressure data and fluid recovered, a final decision on the commercial aspects of the zone tested can be made. An indication of producing equipment needed can be predicted from the formation test. Pressure data will indicate whether the well will flow or require pumping equipment.

The nature of the fluid recovered and the amount of accompanying gas will indicate type of equipment needed at the surface to make preliminary tests. This region has many unit operations in effect and the formation tests taken on wells drilled outside the participating areas is a means of determining if the unit participating area should be enlarged.

Basin-by-Basin D.S.T. Conditions

(Continued from page 102)

area since the need has not been shown so far. Due to the multiplicity of producing zones logged in Utah, straddle tests have been required frequently; about 7 out of 10 tests conducted to date have proved successful. Bombs are equipped usually with 8,000-lb. springs.

There has been some difficulty in finding adequate packer seats and long lengths of anchor have been required, but as much as 500 ft. of anchor has been used without incurring damage to drill pipe. Testing tool is left open for from 1 to 2 hours. Shut-in time to obtain pressure buildup of from 20 to 30 minutes is employed.

Due to the wide prevalence of circulation losses in the Uintah basin, many test failures have resulted from plugging of the main valve. This difficulty has been solved by use of the recently developed hydraulic test tool with a 1-in. main valve opening.

Due to low penetration rates, characteristic of Uintah basin drilling operations, preparation time for a formation test has not been too lengthy. Usually a test can be obtained after circulating for about 1½ hours.

Denver-Julesburg Basin

Open-hole testing in the Denver-Julesburg basin has not proved to be a routine procedure. Presence of many soft shale and bentonite beds above the Dakota series often interferes with testing. So far, however, no formation presently productive has shown itself not capable of being tested.

Considerable rat-hole testing is done in the Colorado portion of the basin. However, in Nebraska, use of double packers in a full hole (usually 8-in.) has proved satisfactory. As a rule, 12,000 to 14,000 lb. of weight on the full-hole packer, and 8,000 to 10,000 lb. on rat-hole packers, will give a good seat. Due to thin producing sections, anchor lengths seldom exceed 50 ft. Bombs with 3,000-lb. pressure elements are quite satisfactory in obtaining reservoir pressure data. Tool-choke size is usually 5/8-in. unless some of the prolific gas zones in the Dakota "D" series are being tested. Due to permeability conditions usually being well above average, a 1-hour test often proves satisfactory as does a 20-minute shut-in pressure test.

Circulating time prior to testing probably should be lengthy enough to include two full cycles of constant-viscosity mud. Bridges and sloughing often interfere with tests in this basin; they are best counteracted by a mud with a viscosity of between 80 to 100 seconds. Oil-emulsion mud has been of considerable aid in reducing this problem in the Powder River basin; it is reasonable to assume its application would be the same in this basin since the same sequence of Cretaceous formations are penetrated. Due to the conditions mentioned above, no test should be attempted in this basin without jars and safety joint being included in the tool string. There has been no need for the use of water cushions in drill-stem tests conducted in the Denver-Julesburg basin.

Big Horn Basin

Big Horn basin of northwestern Wyoming contains a number of producing horizons ranging from Cretaceous to Mississippian in age. No particular troubles are encountered in testing these formations; procedures vary according to company policy. Both rathole and full-hole testing are employed and weights on packers vary according to packer size and depth of well.

Successful testing was carried out without the use of jars and reversing tools for many years, but the advent of their use has found them to be employed quite frequently. Since producing horizons are found ranging in depth from a few hundred feet to almost 13,000 ft., pressure elements used in the bombs vary according to field and area within the basin. Test lengths are

largely dictated by the amount of information desired for holes stand up fairly well in this province. Lost circulation is a frequent problem in the basin but as a rule this condition is remedied by the time testing is in order.

It might be of interest to mention the influence of hydrogen sulfide accompanying some Permian production in this basin. If formation testing can be avoided under this condition, it should be done, but in wildcats this is very difficult to do for often the formation-test information is needed.

An elaborate procedure is necessary to safeguard the lives of personnel from a gas whose toxicity can be fatal where it exceeds 0.1 per cent. Arrangements should be made to provide each member of the crew with a mask for a 30-minute supply of fresh air or similar mask which is not susceptible to malfunctioning due to extreme cold. All crews and supervisors should be thoroughly familiar with the operation of the mask in use. At least one and preferably two resuscitators should be available at the well site.

Tight Connections

The manifold should be equipped with valves and unions that are as tightly connected as possible in order to avoid leaks. A hydrogen sulfide indicator should be in use on the floor to indicate the degree of toxicity. The line from the rig floor to the separator and then to the burning pit should, if possible, be approximately 150 ft. in length and in such a direction that the prevailing wind will carry the fumes away from the rig. During the time the test tool is open and while the test is being pulled, a man should be stationed on the walk, equipped with a gas mask; he should be capable of operating the rig and aiding personnel in event of accident. Poisonous fumes may overcome the crew before they can get on their masks. A flare should be burning at the burning pit before the test tool is opened. It is probably desirable that some sort of a cushion be used in these tests in order to forewarn the arrival of gas and oil to the surface if the test flows. This is one type of test that should be reversed and, therefore, the reverse tool becomes the most important tool in the string. The positive-type reverse tool (opened by rotating the drill pipe at the surface), should be used.

A secondary tool, usually the "bar-sub" (opened by a bar dropped from the surface), can be run as an auxiliary tool to use in event of failure of the positive-type tool. By incorporating a separator in the surface setup, an orifice flange can be installed in the gas line and a record of the gas flow obtained with a portable orifice meter. In the

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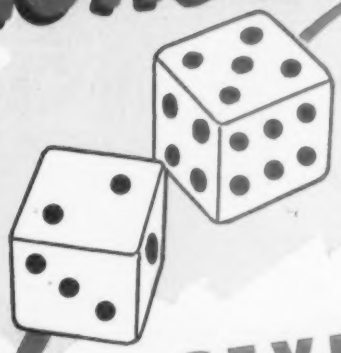

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Powder River Basin

A considerable portion of the testing done in the Powder River basin is done in Cretaceous formations which vary in depth from 1,200 to 9,500 ft. It is not always easy to obtain a test in these formations since there is considerable amount of soft shale and bentonite beds existing above the formations.

Frequently double packers are used in attempting to get a test and whenever it is necessary to set packer in the thin shale above the soft sand bed the double packer has not been successful. It is very seldom that a water cushion has to be used in this basin because of high-velocity flowing conditions. Most of the time it is used only to protect the drill pipe.

Mud condition is a highly important angle to be considered prior to testing in the Powder River basin. In the south end of the Powder River basin, considerable success has been achieved in maintaining hole wall by the use of oil-emulsion mud. So far as is known, very few tests have been accomplished in this basin with the anchor exceeding 200 ft. in length.

All types of test tools have been employed and very little trouble is encountered with any one type tool. Depending on the area, pressure elements for obtaining reservoir pressures usually vary from 3,000 to 5,000 psi. Due to the constant threat of sloughing shale and bentonite bridges, considerable use is made of jars in the test tool string. It is estimated that probably 25 per cent of the tests performed in the basin require either jarring or an extra pull on the drill pipe to get the tool string loose. All formations presently producing in the Powder River basin are capable of being tested.

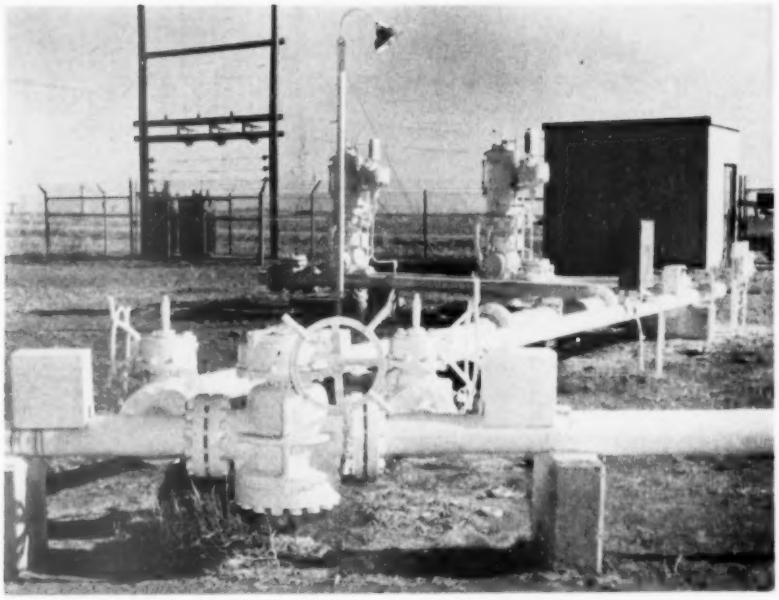

Fig. 1—Boise City, Okla., remotely controlled automatic booster station.

Case history . . . and economics of an

Automatic Booster Station

Lower operating cost with resultant quick payout . . . this is behind the development of the automatic, completely unattended booster station. Operating procedure is included in this account of the Boise City, Okla., automatic booster station on the Borger-Denver products pipe line.

by G. P. Jennings* and M. E. Worlow†

WITH regard to the economics of remotely controlled station operation, a major factor is that no operating personnel are required outside of occasional inspection of the premises and equipment. A small building for the controls represents the total housing requirement. Further, auxiliary equipment which is normally a part of a conventional type pump station, is not needed, resulting in minimum upkeep and attendance. As a payout investment such a station represents rapid retirement of investment, barring extreme operational difficulties.

The Boise City booster station described here represents increased capacity at a minimum in investment. The horsepower requirement to obtain the desired increase in rate was about 200. To construct facilities for a fully manned station for this small horsepower requirement would have cost at least twice the amount of this automatic station. Only about 10 per cent of the entire cost of this station was required for necessary automatic controls added, above the equipment without controls. This station is a fully automatic, remotely controlled station without attending personnel.

*Chief engineer and †engineer, Phillips Pipe Line Co. Paper presented at A.P.I. division of transportation meeting, Kansas City, Mo., April 1953.

The Borger-Denver System

The original 6-in. Borger-Denver pipe line began operation in January 1948, originating in Borger, Tex., with the initial terminus at La Junta, Colo. In January 1951 it was completed into its present terminus at Denver. Of the four stations—Rocky (Borger), McKee, Boise City, and La Junta—Boise City is the only remotely controlled station. The remote-control equipment is located at McKee station, 62.3 miles upstream. The Borger-Denver pipe line is 358 miles in length, operating as a joint venture between Phillips Petroleum Co. and Shamrock Oil & Gas Co.

Capacity . . . During the first year of operation, the system transported an average of 4,000 bbl. per day of finished products. At the present time, as a result of expanding markets in the intermountain area, the rates of operation are 11,900 bbl. per day through the Borger-La Junta section and 8,500 bbl. per day between La Junta and Denver. Such increases required additional pumping equipment at existing stations, and the activation of the Boise City booster late in 1951. Fig. 2 represents the profile of the line to include the additional remote booster, located at Cowans, Colo., to be completed before the middle of this year. The Borger-Denver pipe line is used solely for finished products—including kerosine, all grades of gasoline (regular, premium, third grade, and aviation), and liquefied petroleum gas products (butane and propane).

Booster Equipment

The equipment for a remotely controlled booster can be classified into two divisions—pumping equipment and control devices. The pumping equipment at Boise City consists of two 100-hp., 4 by 4-in. by eight-stage vertical stuffing-boxless electric units. Maximum capacity of this unit is 14,000 bbl. per day with a 790-ft. head.

Mechanical seals . . . The stuffing-box-less-type pump incorporates a number of desirable features for this type of remote operation including assurance against seal failure releasing products to the atmosphere. The unit is completely enclosed with two mechanical seals or dual seals located on either side of a "dead chamber." The dead chamber is located between the pump chamber and the motor location.

The chamber adjacent to the pump side is open to the pump suction, thus being constantly under line pressure of the pumpage. The dead chamber is filled with oil as is the motor chamber. A small circulating pump, located in the bottom of the motor chamber, keeps the oil continually circulating through the cooling coils, which are located in the pump chamber.

A line from the second stage of the pump maintains a 30-lb. pressure on a spring-loaded, flexible diaphragm, which, during operation, separates the pumpage from the motor oil in the diaphragm chamber. Therefore, any leakage resulting would be from the motor side of the unit to the pump as long as pressure is maintained through the diaphragm chamber onto the dead chamber. The dead chamber becomes a sealed chamber of oil unless one or the other of the seals should leak. The bleeder valves are so located to readily check for contamination and leakage.

One bleeder is located on top of the motor chamber. The other bleeder is located off the dead chamber allowing for a check of pumpage leak through the lower seal.

The oil-filling system is tied into the diaphragm chamber, the motor chamber, and the dead chamber. A check valve, located in the dead-chamber line, prevents oil leakage from this chamber, except through seals. A small-capacity hand pump is used to fill the oil system.

Safety controls . . . Among the control devices incorporated into this operation are a number of safety controls for the protection of the equipment. Included are two pressure switches—one to open on decrease in suction pressure below 500 psi.; the other to open should the discharge pressure rise above 1,500 psi. A magnetic switch, an integral part of the pump units, will open in case of seal failure, diaphragm failure, and circulating oil loss. Another control will indicate low oil level.

The above control devices are activated through the remote-control telephone dialing system located at the McKee pump station, 62.3 miles southeast of the Boise City site. These controls are energized through a mechanically held relay which is actuated by the remote telephone dial. A combination magnetic starter with a selector switch will energize the time-delay relays which are adjustable. The time delay for Unit No. 1 is set for starting 30 seconds after being energized, and Unit No. 2 is set for 180 seconds delay.

Equipment arrangement . . . Figs. 1 and 2 give both a photographic and schematic picture of the arrangement of the equipment at the Boise City booster. These pumping units are further protected by a check valve on the downstream side of Unit No. 2 to prevent a back surge of pressure on the pumps in event of a sudden shutdown by the downstream station. Also located on the upstream side of Unit No. 1 is a bypass with a check valve in the crossover and a 2.04-in. flat plate orifice. This design allows for a small amount of flow to continue through the pump during shutdown periods. This assures against the contamination of products on startups with pumpage which would be laying in the pump during shutdown periods. Six-inch valves are located in both the intake and discharge tieins to the main line. An 8 by 12-ft. building is provided for the housing of the control equipment.

Remote control . . . At the end of the time delays of 30 seconds for Unit No. 1 and 180 seconds for Unit No. 2, the units are on line. Threafter, until the operator dials for a shutdown, the units will continue in operation, unless either the discharge or suction pressure switches or the oil system protection shuts down either or both of the units. If this happens, the McKee operator will recognize it from his pressures, and he will immediately monitor the units to determine the difficulty. If the shutdown should be a result of a temporary power failure or momentary loss of suction pressure or high discharge pressure, and the condition is corrected, the operator will not have to restart the units by dialing.

Should an oil loss occur, the magnetic switch, located in the lower portion of the diaphragm chamber, becomes activated, thus shutting down the unit. Such a loss would require that personnel correct the condition before the unit could again be started. Oil loss could further indicate diaphragm failure or seal failure.

Periodic inspections are recommended to check the operation, particularly to determine if the seals are leaking product into the dead chamber or motor chamber. Our personnel inspect the Boise City facilities about one each month.

The rental cost of the telephone equipment is somewhat less than normal wages plus benefits for an engineer-attendant.

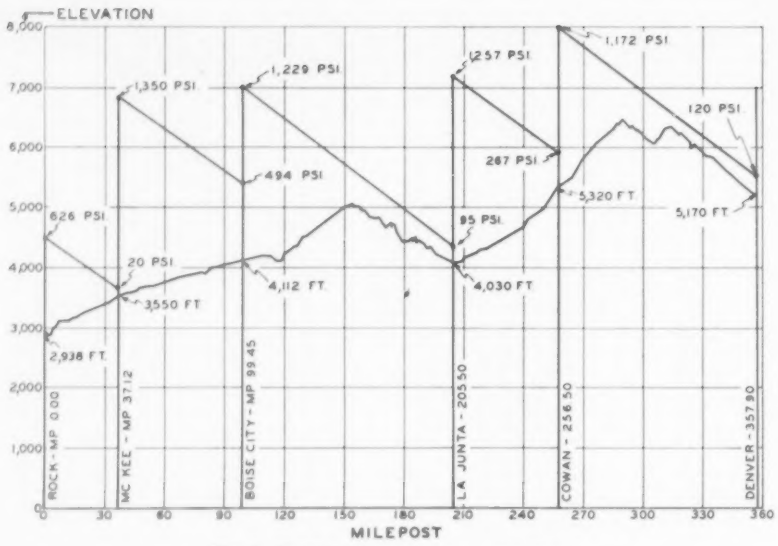

Fig. 2—Profile of Borger-Denver pipe line.

Operational Procedure

The entire operation of the Boise City booster is through a remotely controlled telephone dialing system located at McKee station (the next upstream station). An operator may, by dialing one of the five assigned numbers, perform the following:

1. Start both units.
2. Stop both units.
3. Monitor Unit No. 1.
4. Monitor Unit No. 2.
5. Monitor oil level.

By monitoring the operation, the op-

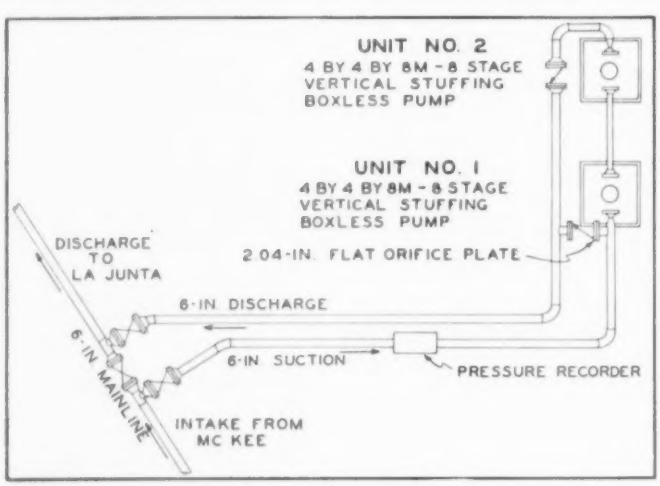

Fig. 3—Boise City remotely controlled automatic booster.

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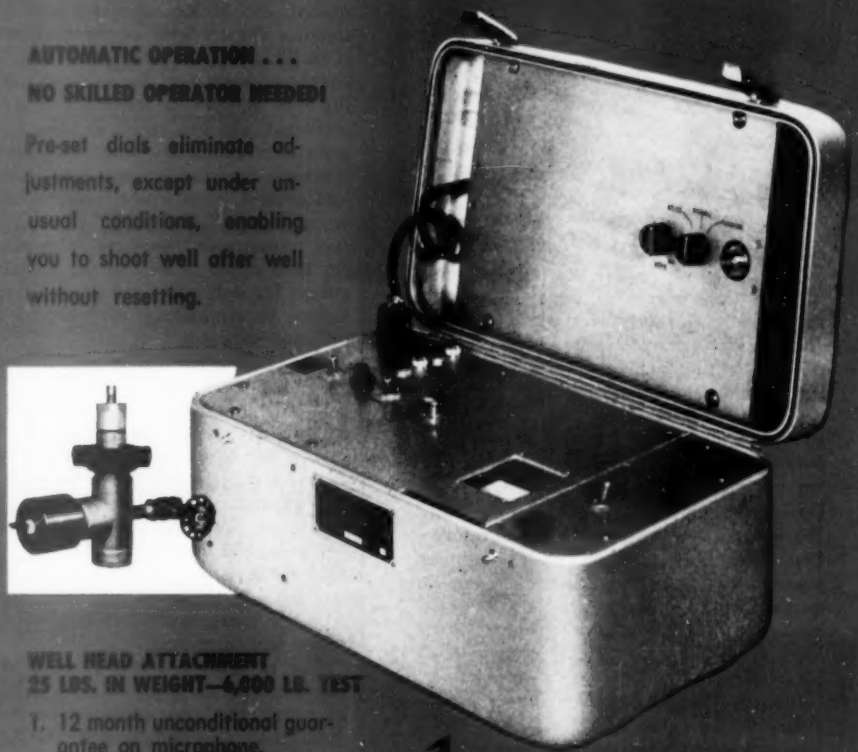
NO SKILLED OPERATOR NEEDED!

Pre-set dials eliminate adjustments, except under unusual conditions, enabling you to shoot well after well without resetting.



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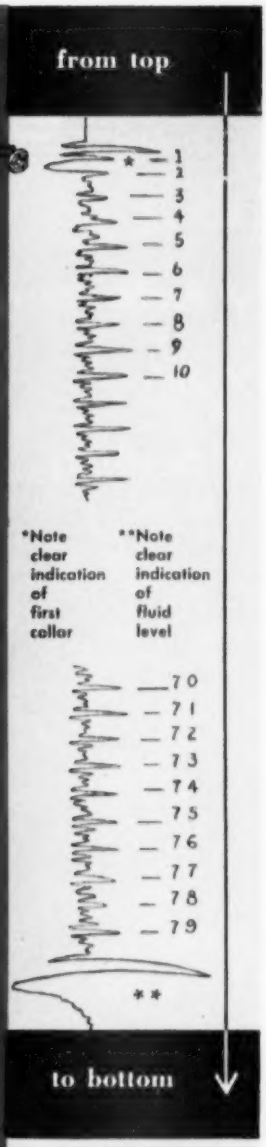

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✓ Safety

✓ Durability

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Ball-bearing mounted rolling tail pipe with manual locking device. Safer, faster, easier on all winching operations. Heavy duty construction will last the lifetime of the truck.

Double or single gin pole pocket settings. These settings provide a wider rolling area.

The body deck plate is flush mounted over the rear half of the body offering a tempered plate protection as heavy equipment is winched onto the truck bed. The fore part of the body is center-matched hardwood flooring.

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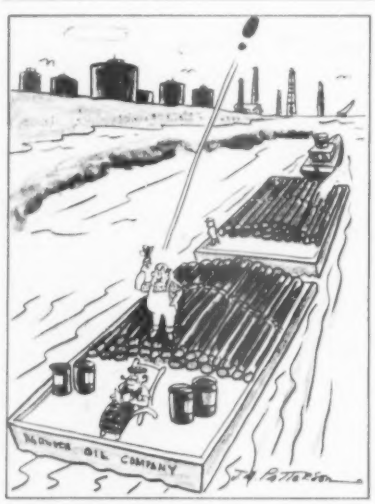
erator can readily determine if the unit is or is not in operation. An interrupted tone indicates the unit is operating while a steady tone indicates the unit is not operating. Further, the operator can check the oil level by dialing the monitor code assigned for the oil level. In this case, an interrupted tone indicates to the operator that the oil level is satisfactory while a steady tone indicates a low oil level. Both units start or stop on the same dial code.

Starting the booster . . . When operation of the Boise City booster is required, the McKee operator will first monitor the oil level of the units, and if satisfactory, he will then dial the number for starting the units. On dialing this number, a telephone relay is activated, and this relay, in turn, energizes a mechanically held relay which actuates combination magnetic starter and control transformer. This, in turn, energizes the discharge and suction pressure switches and the time delay relays for both units, as well as the magnetic switch for indicating seal or diaphragm failure or circulating oil loss and the oil level indicator.

The equipment, as presently operated, has been generally satisfactory. The only continuing problem at present is mechanical seal failure. The exact reason for the seal failures has not been fully determined, but we feel, as our experience with mechanical seals continues, the condition will improve. More careful installation, refined lapping methods, and elimination of minute foreign matter which will injure the seal faces, will contribute to improve seal operation.

Our experience has proved satisfactory enough so that we feel justified in continuing and adding to our remote control operation with the addition of the Cowans, Colo., booster located between La Junta and Denver.



It's BAASH-ROSS... FOR EVERYTHING IN SQUARE KELLYS.

All Sizes—All Designs—All Lengths

PLUS the Most Advanced Construction and Metallurgical Features!

FOR YEARS Baash-Ross has led in the development of a superior line of square Kellys to meet the increasingly rigid requirements of modern drilling operations. And best of all, these top-quality Kellys are available in a range of sizes and designs to meet every operator's need...with or without stop shoulders, elevator spaces, etc.... and in all lengths.

In fact, Baash-Ross provides everything in square* Kellys!

The Most Advanced Performance Features!

- Baash-Ross Square Kellys are made of restricted analysis, fine-grained alloy steel, with each heat of steel individually checked for quality by separate test specimens.
- Before heat treating, the dimensional accuracy of the square section is checked by an API Kelly Sleeve Gage which must pass freely over the entire length of the square to check maximum allowable tolerances across flats and across corners. Also, accurate caliper measurements are taken to make sure no portion of the driving section is undersize!
- Next, a series of heat-treating operations performed over the *entire length* of the Kelly in one operation, develop the metallurgical properties of the steel to provide the *best balance* of shock-resisting toughness and wear-resisting hardness.
- Additional heat-treatments harden the threaded ends for maximum life and service.
- All residual stresses are relieved by these heat-treating processes, thus eliminating the most prevalent cause of bending and deformation in Kellys.
- The Kellys are then carefully bored by precision drilling machines so that the bore is precisely centered end-to-end, then double-checked by highly-accurate survey devices. For products with bores 2¼" diameter or larger, wall thickness of the Kelly *must not* vary more than one-*sixteenth* inch for each 10 ft. of product length, or fraction thereof.
- The Kelly itself is also accurately surveyed for straightness and *must* be straight within one-*eighth* inch when measured at any point over its entire length.
- The alignment of the projected axis of each threaded end, when checked with the precise Baash-Ross Alignoscope, *must* be within one-*eighth* inch of the longitudinal axis of the Kelly for each 10 ft. of Kelly length, or fraction thereof.
- In addition, threads *must* pass, not only all API specifications, but also unusually rigid Baash-Ross specifications on thread form, taper, lead, finish, etc.

They are Available in

..All Sizes **..All Designs**

Baash-Ross "Trubore" Upset Square Kellys

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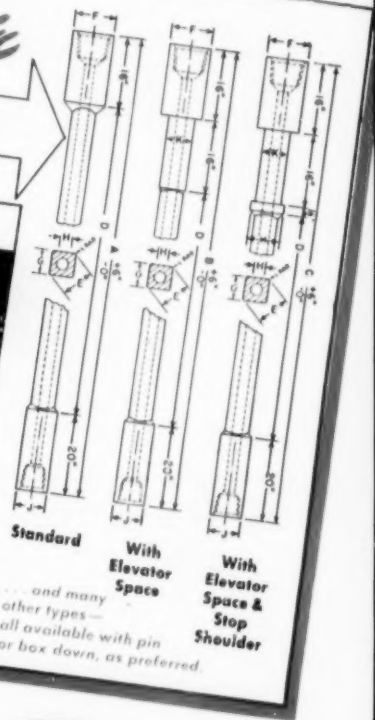
2½	35	39-4	41-4	32	4½ Reg. 6⅝ Reg.	5⅛*	2⅞ Reg. 2⅜ I.F.	3⅛ 6⅜	1⅛ 1⅛	4⅜	2⅝	2⅞	4⅝	3⅝	*.165 .327
2¾	35 39 41	39-4	41-4	32	4½ Reg. 6⅝ Reg.	5⅛* 5⅜	2⅞ Reg. 2⅜ I.F.	3⅛ 3⅜	1¼ 1¼	4⅝	2¾	2⅞	4⅝	3⅝	*.165 .327
2¾	35 39 41	39-4	41-4	32	4½ Reg. 6⅝ Reg.	5½* 5⅝	3½ Reg. 2⅞ I.F.	4⅛ 4⅜	1½ 1½	5⅛	3	3⅛	5⅛	4⅛	*.165 .327
3	35 39 41	39-4	41-4	32	4½ Reg. 6⅝ Reg.	5½* 5⅝	3½ Reg. 2⅞ I.F.	4⅛ 4⅜	1½ 1½	5⅛	3	3⅛	5⅛	4⅛	*.165 .327
3½	35 39 41	39-4	41-4	32	4½ Reg. 6⅝ Reg.	5½* 5⅝	4½ Reg. 3½ I.F.	5⅛ 5⅜	2¼ 2¼	6⅛	4	4⅛	6⅛	5⅛	*.165 .327
4	35 39 41	39-4 41-4	41-4 43-4	32 35	4½ Reg. 6⅝ Reg.	5½* 5⅝	4½ Reg. 3½ I.F.	5⅛ 5⅜	2¼ 2¼	6⅛	4	4⅛	6⅛	5⅛	*.165 .327
4½	35 39 41	39-4 41-4	41-4 43-4	32 35	6⅝ Reg. 6⅝ Reg.	5⅝ Reg. 5⅝ I.F.	6⅝ Reg. 4½ I.F.	6¼ 6⅜	2¾ 2¾	6⅝	4½	5⅛	7	5⅝	.327
5	35 39 41	39-4 41-4	41-4 43-4	32 35	6⅝ Reg. 6⅝ Reg.	6⅝ Reg. 5⅝ I.F.	6⅝ Reg. 4½ I.F.	6¼ 6⅜	2¾ 2¾	6⅝	4½	5⅛	7	5⅝	.327

* Alternate 5⅝ inches O.D.—140 cu. ft. per lineal ft.
† Volume based on largest diameter of kelly.



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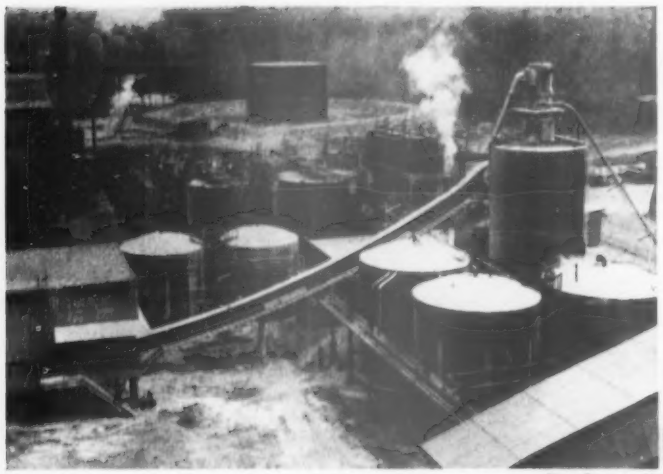

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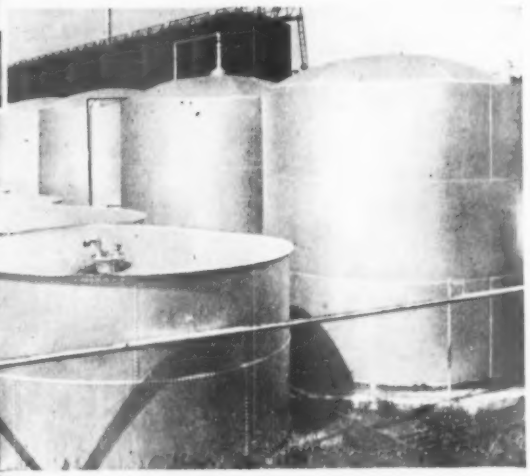

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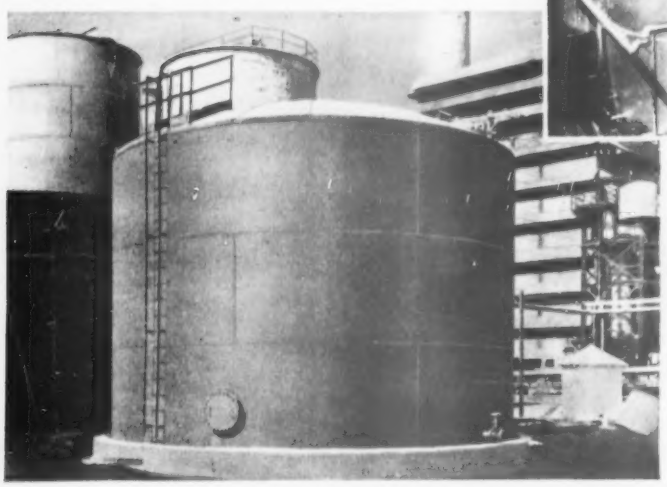

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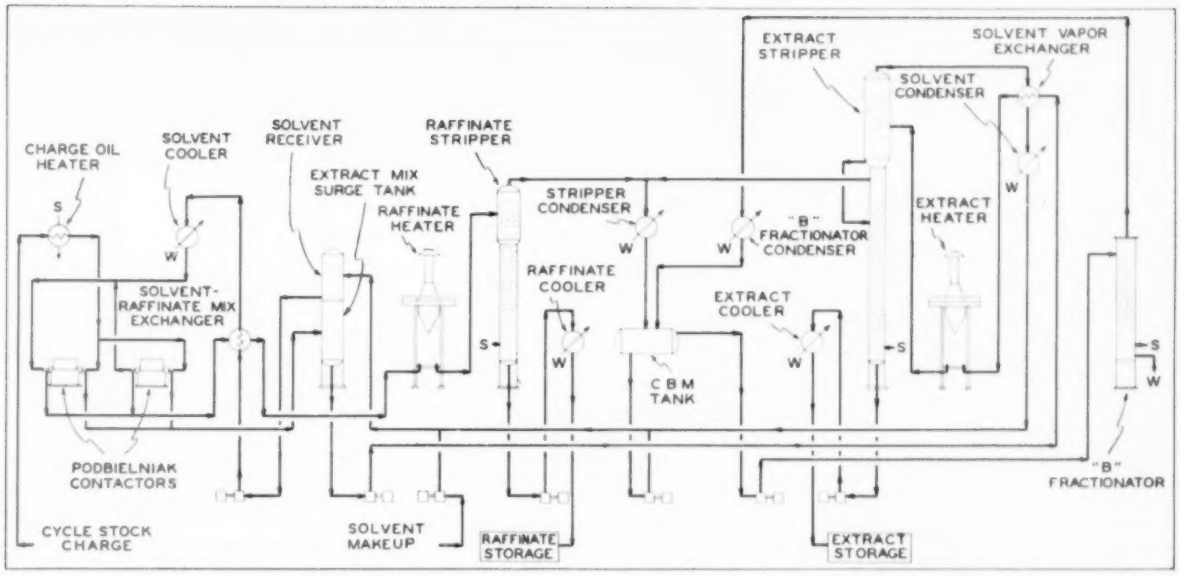

DIAGRAMMATIC FLOW SHEET of a furfural unit for treatment of cycle stock with i.b.p. of 500° F. Fig. 1.

Catalytic Cycle-Stock Treating Unit

Typical study of application of furfural treating of cat cycle stock to small refinery

by C. F. Tears*

Small Refiner Confronted By Serious Problem

IN this day of more and more crude capacity requirement and higher and higher gasoline octane levels, the small refiner (total crude charge capacity, 20,000 bbl. per day or less) in particular is confronted with serious problems in maintaining his position in the race.

In this class of refinery, the complete crude operation is usually balanced around a single catalytic cracking unit. The cost of that catalytic cracking unit both in investment and in operating cost is disproportionate to the remainder of the units in the refinery. The refiner usually pushes the cat cracking unit to its upper capacity limit and in so doing frequently hits a bottleneck in coke-burning capacity or in the limited capacity of the gas-recovery facilities.

All prognostications appearing in current literature lead to the conclusion that in the future more and more crude capacity will be required and that the competitive octane level of the over-all gasoline product will continue to rise. For the type of operation now employed by most small refiners this means that he is, or soon will be, confronted with the necessity of increasing his already large investment in catalytic cracking capacity and also with higher and higher operating costs per barrel of crude run.

One method of alleviating the difficulties of this situation is to install a treating unit for catalytic cycle stock.

FURFURAL extraction of cycle stock from a catalytic cracking unit enables the refiner to increase the virgin charge capacity of the unit substantially, with a significant increase in percentage yield of catalytic gasoline.

The coke-burning requirement for the unit is considerably reduced when cycle stock extraction is employed. Production of poly gasoline is increased. The octane level of total gasoline production from crude is improved, and operating costs per barrel of virgin charge to the cat cracker are decreased.

For a refinery charging 12,000 bbl. per day in balance operation, calculations substantiated by plant operations show:

- Crude charge capacity increase to 18,700 bbl. per day.
- Virgin cat cracker charge capacity increase from 4,500 to 7,000 bbl. per day.
- Increase in per cent yield of cat gasoline, based on virgin charge, from 51.3 to 57.1.
- Coke-burning requirement reduction from 7,150 to 3,100 lb. per hour.
- Poly gasoline production increase from 380 to 422 bbl. per day.
- Cat cracker investment reduction from $890 to $680 per barrel of daily virgin charge capacity.

*President, Tears Engineers, Dallas.

System operation . . . Performance data on furfural treatment of catalytic cycle stocks have been published in recent literature. The basic process is licensed by Texaco Development Corp., New York.

Improvements in the design of such units with respect to both the treater itself and the solvent-recovery facilities have been developed as a result of experience in the operation of existing units. The latest design employs Podbielniak contactors instead of the conventional treating tower and a simplified recovery system, both to accomplish a reduction in plant cost.

The first installation of Podbielniak contactors in a furfural unit has now been in satisfactory operation at the Marcus Hook refinery of Sun Oil Co. for the past year. The installation was designed by Tears Engineers, of Dallas, with field construction by Sun Oil Co.'s construction force. The Sun unit is employed for solvent treating a series of naphthenic lubricating oils in the

22,000 hrs. of service without repair!

KENNETH FORKER
CRANE SERVICE - MARL - BULLDOZING
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PHONE 3304

November 21, 1952

The Pierce Governor Company, Inc.
Anderson, Indiana

Attention: Mr. Thos. L. Marks

Dear Sir:

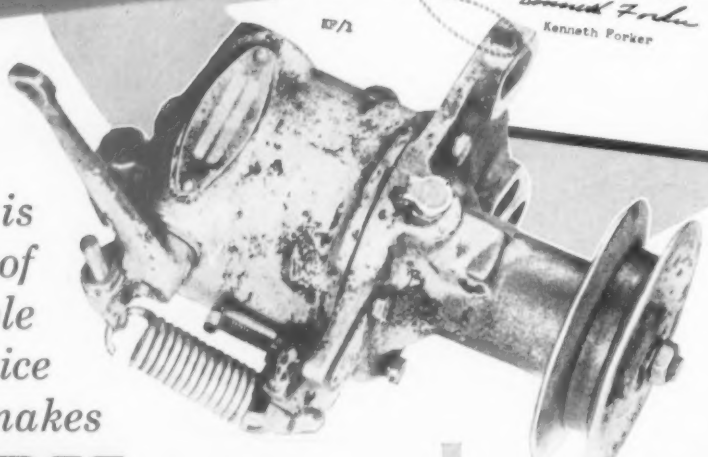
I have a Pierce governor on an industrial power unit in an Osgood crane. I bought the crane in January 1946, and it has been in continual use since that time. It has an hour meter which registers 22,000 hours. Figuring 40 miles per hour this governor would have 880,000 miles, giving complete service without repairs.

I believe this is very good service and certainly speaks a good word for the Pierce governors.

Just wanted you to know how satisfied I am with your governor.

Very truly yours,
Kenneth Forker

EF/1



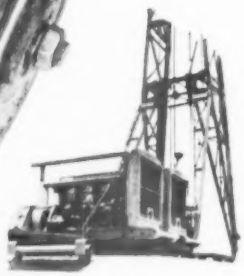
...this is the kind of dependable service that makes

PIERCE GOVERNORS preferred!

Mr. Forker's Pierce Governor worked the equivalent of 12-hour days for six straight years without the first sign of trouble or wear.

When you buy Pierce-governed power equipment you are assured of unsurpassed governor performance and trouble-free service . . . usually for the life of your engine. That's why Pierce is preferred.

There's a Pierce Centrifugal Governor for gas, gasoline and diesel engines in every industrial use. Write for specific information.



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IF your present governor is giving you trouble, tell us about it. Chances are we can supply you with a replacement that will solve your problem fully.

same gravity and distillation ranges as those required for cycle-stock extraction. Thus, the performance of the contactors in commercial operation has been amply demonstrated.

Fig. 1 is a diagrammatic flow sheet of a furfural unit for treatment of cycle stock with a minimum initial boiling point of 500° F. This assumes that the lower-boiling cycle-stock fraction, that is from 400° to 500° F., would be segregated and not subjected to furfural refining. While cycle stocks having initial boiling points below 450° F. can be charged to a furfural operation it is generally more advantageous to refine only the higher-boiling fractions.

Typical Application

A typical study of the application of furfural treating of catalytic stock to a small refinery is detailed in the following:

This refinery has a rated crude capacity of 12,000 bbl. per day in a balanced operation around a single fluid catalytic cracking unit. The cracking-unit installation includes a gas-recovery section with a design C_3 recovery of 70 per cent of a U.O.P. catalytic polymerization unit for conversion of propylene and butylene to poly gasoline.

The catalytic cracking unit is designed for a virgin, long-range gas-oil charge of 4,500 bbl. per stream day and a rated coke-burning capacity of 7,200 lb. per hour.

The unit is operated with a recycle ratio of 1:1 to bring the total reactor charge to 9,000 bbl. per day. The design conversion rate, as gas-oil disappearance, is 80 per cent.

Yield picture . . . The design basis develops a debutanized cat cracked gasoline yield of 51.3 per cent on the virgin charge. The total butanes design yield is 19.5 per cent and the total design production of poly gasoline is 380 bbl. per day, or 8.4 per cent of poly gasoline on the virgin charge. The total liquid yield is 90.80 per cent (volume). A complete yield statement on the catalytic cracking operation is as follows:

	Volume (%)	Weight (%)	Bbl. per stream day
Virgin charge	100.0		4,500
Recycle	100.0		4,500
Total charge	200.0		9,000
Dry gas		3.44	
Propylene	7.46		
Propane	4.10		
Butylene	7.60		
Butane	11.90		
Debutanized gasoline	51.30		2,308
Light cycle oil	14.00		
Heavy cycle oil	1.50		
Clarified residue	4.50		
Coke		12.29	*7,150
Total liquid (butane plus)	90.80		
Conversion—gas oil disappearance	80.00		

*Pounds per hour.

This is a typical operation of a characteristic small refinery catalytic cracking unit although the recycle rate and the conversion rate in this particular instance may be somewhat higher than those employed in some similar installations. However, study of the operation of many relatively small catalytic cracking units indicates that the recycle ratio and the conversion rate are being pushed higher in the race for higher yields of catalytic gasoline and higher octane levels. Few of the smaller catalytic cracking installations operate at cycle ratios of less than 1:0.5 or with conversion rates of less than 65 per cent.

Aromatic stock . . . It has been definitely established that the relatively high aromatic content of catalytic cycle stock produces only about 3.0 per cent of gasoline and the remainder goes to more refactory recycle stock, a high gas yield, and excessive coke production.

economically alleviated by removal of the aromatic content of the cycle stock by furfural treatment.

Shelley and Rackley[1] also develop that the aromatic content of first-pass cycle stock may be as high as 40 per cent. In a continuing cycling operation the aromatic content is probably considerably higher. Thus, in a conventional cycling operation at least 40 per cent of the cycle stock is doing practically nothing but producing coke and gas. The operating cost per barrel of aromatics is here considered the same as that for a barrel of virgin charge so the aromatics in the cycle stock are charged to the cracking unit at a heavy loss. Actually, the direct cost of processing a barrel of aromatics is much higher than that for a barrel of virgin stock due to the excessive coke and gas production.

Furfural treatment of catalytic cycle stocks reduces the aromatic content, the sulfur content, and the Conradson carbon content. The furfural raffinate is highly paraffinic. It can be charged back to the catalytic cracking unit where it can be processed to yields at least duplicating those from virgin charge.

Furfural raffinate . . . Shelley and Rackley show once-through yields from

" . . . bottlenecks can be quickly and economically alleviated by removal of the aromatic content of the cycle stock by furfural treatment."

Shelley and Rackley[1] have reported the catalytic cracking yield from the aromatic extract from cycle stock as follows:

Carbon, weight per cent	12.0
Gasoline, volume per cent	3.0
Total gas, weight per cent	4.7
No. 2 fuel oil, volume per cent	8.4
Heavy gas oil, volume per cent	69.0

These figures are interesting. A study of them leads one to the following conclusions:

1. The gasoline yield is only about 6.7 per cent of that to be expected from virgin charge.

2. The coke production is approximately 450 per cent of that from a normal virgin charge.

3. The gas production per unit of gasoline produced is approximately 300 per cent of that from virgin stock.

In order to squeeze the last drop of catalytic gasoline out of the cycle stock the smaller refiner usually end up with a bottleneck in coke-burning capacity and often with a bottleneck in gas-recovery capacity for a limited additional yield of gasoline. Fortunately these bottlenecks can be quickly and

cycle stock furfural raffinate as follows when a 40 per cent extract yield is taken:

Carbon, weight per cent	1.6
Gasoline, volume per cent	42.2
Total butanes, volume per cent	13.4
Dry gas, weight per cent	6.0
No. 2 fuel oil, volume per cent	12.1
Heavy gas oil, volume per cent	34.7

Note that in all respects these yields closely approach those to be expected from a once-through operation on virgin charge. The gasoline yield is a little low but the gas yield is also low and the coke production appears to be very low.

Charging furfural raffinate as cycle stock results in the practical equivalent of a once-through operation but with the over-all percentage yields figured on the virgin charge only.

Removal of the aromatics from the cycle stock makes way for at least an equivalent volume of virgin charge. If the catalytic cracking unit virgin charge capacity, in a cycling operation, is limited by coke-burning capacity or gas-recovery capacity, the increase in virgin charge rate can be considerably

more than the volume of aromatics removed from the cycle. Thus, furfural treating of cycle stock increased the virgin charge capacity and makes possible increased crude runs in a balanced operation with no additional investment for catalytic cracking and associated operations except possibly for an increase in condensing surface.

Extraction advantages . . . In the example under discussion, study has developed that a furfural extraction unit with a charge capacity of 3,300 bbl. per day charging only the cycle stock with a minimum initial boiling point of 475° F. accomplishes the following:

1. The virgin charge capacity of the catalytic cracking unit is increased from 4,500 to 7,000 bbl. per stream day for the same total reactor charge of 9,000 bbl. per stream day, thus permitting a balanced crude operation at 18,700 bbl. per stream day instead of the present rated capacity of 12,000 bbl. per stream day with only minor changes in the catalytic cracking unit itself.

2. The percentage yield of catalytic gasoline in the virgin charge is increased from the design basis of 51.3 to 57.1 per cent.

3. The total production of catalytic debutanized gasoline is increased from 2,308 to 3,997 bbl. per stream day.

4. The coke-burning requirement is reduced from 7,150 to 3,100 lb. per hour.

5. The amount of noncondensable gas charged to the gas-recovery section for this extreme case is increased by about 10 per cent.

6. The production of poly gasoline is increased from 380 to 422 bbl. per stream day. Note that this is a decrease in poly gasoline percentage yield resulting from the lower gas production per unit of gasoline produced.

It is interesting to note that the total percentage yield of debutanized gasoline plus poly gasoline is 59.7 per cent for the old operation and 63.1 per cent for the new operation utilizing furfural treatment of heavy cycle stock.

Increased yields . . . The detailed yield figures on the new operation at the catalytic cracking unit were developed as follows:

	Volume (%)	Weight (%)	Bbl. per stream day
Virgin charge	100.0		7,000
Recycle as furfural raffinate	22.2		2,000
Total	122.2		9,000
Dry gas		2.5	
Propylene	4.8		
Propane	2.9		
Butylene	5.8		
Butane	7.8		
Debutanized gasoline	57.1		3,997
Light cycle oil	10.0		
Heavy cycle oil			
Clarified residue			
Furfural extract	19.0		
Coke		3.4	*3,100
Total liquids (butane plus)	99.7		
Conversion—gas oil disappearance	71.0		

*Pounds per hour.

Cost comparisons . . . The catalytic cracking unit under discussion here was completed in 1952 at an approximate total cost of $4,000,000 including the catalytic section, the gas-concentration section, and the catalytic polymerization unit. At the rated virgin charge capacity of 4,500 bbl. per stream day this represents an investment of $890 per barrel of daily virgin charge capacity.

With the addition of a furfural treating unit the cracking-unit virgin charge capacity is increased to 7,000 bbl. per stream day when the reactor charge rate is held at the same level as for the design operation and with the percentage yield of gasoline on virgin charge increased. This immediately reduces the investment in the cracking area only from $890 to $570 per barrel of daily virgin charge capacity plus

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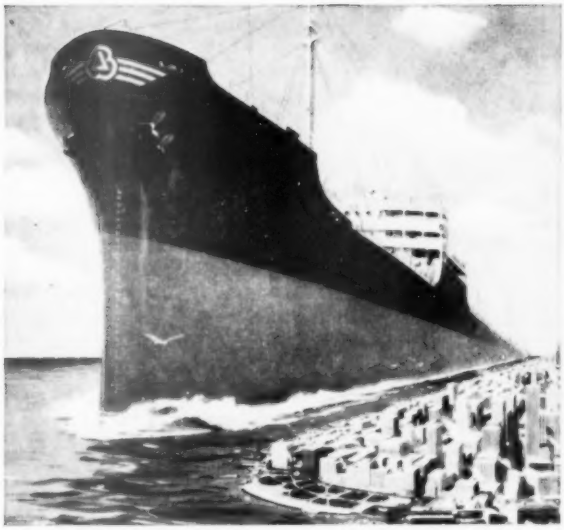

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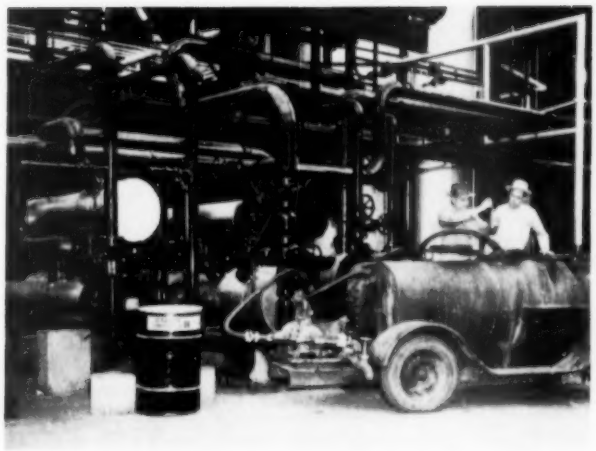

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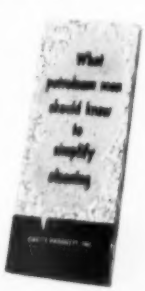

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" . . . a means of improving present-day catalytic cracking operation at minimum investment and minimum operating costs."

the cost of additional gasoline condensers.

If this refiner were called upon to increase his virgin charge capacity from 4,500 bbl. per stream day to 7,000 bbl. per stream day with the same recycling operation now employed, the additional catalytic cracking facilities would cost $2,200,000 on the assumption that the "per barrel" cost were the same as for the existing unit. Furthermore, he would make only a total of 3,591 bbl. per stream day of cat cracked gasoline while by adding only furfural treating of cycle stock at a much lower investment he would make 3,997 bbl. per stream day from the same virgin charge.

In the new operation at 7,000 bbl. per stream day of virgin charge, fixed charges on the catalytic cracking operation remain the same and there is practically no change in the direct operating costs. Thus, the total operating cost per barrel of virgin charge is immediately reduced by approximately 36 per cent.

Offsetting these savings are the furfural treating unit investment and operating costs.

In the example being considered, there is required a furfural treating unit of 3,300 bbl. per stream day cycle stock charge capacity designed for maximum rejection of aromatics from the cycle stock. In this example the design is being conservatively based upon a raffinate yield of 60 per cent and an extract yield of 40 per cent.

Furfural unit costs . . . The total installed cost of the furfural unit would be approximately $750,000 with the total cost fluctuating with local conditions and owner preferences. Note that this investment is only one-third that required for catalytic cracking facilities to accomplish the same increase in virgin charge capacity and the furfural processing produces more cat gasoline from the same virgin charge.

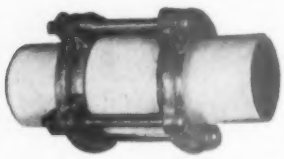
Addition of this investment to the original $4,000,000 investment increases the total of $4,750,000, or $680 per barrel of daily virgin charge capacity.

Direct operating costs for the furfural unit would be approximately 10 to 15 cents per barrel of cycle-stock charge, depending on utility and labor costs. Note that this is equivalent to only about 5.6 cents per barrel of virgin charge to the unit. This is more than offset by the saving in operating cost per barrel of virgin charge realized by the increase in virgin charge rate to the catalytic cracking unit. But the most important consideration is the fact that the operating cost for furfural treating is only 23.5 cents per barrel for the increased gasoline yield over the design capacity of the unit and 10 cents per barrel of total catalytic gasoline produced.

Furfural extraction of catalytic cycle stocks provides a means of improving present-day catalytic cracking operation at minimum investment and minimum operating costs. It provides the small refiner with a low-cost method of increasing his crude capacity in a balanced catalytic cracking operation while increasing both his percentage yield of catalytic cracked gasoline and the over-all octane level of the total gasoline production.

Reference

1. Shelley, C. W., and Rackley, C. W., "Better Yields from Cat Cracking," Petroleum Processing, Vol. 7, No. 12, Dec. 1952.



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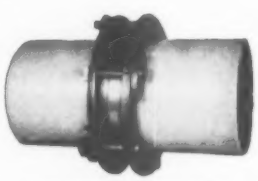

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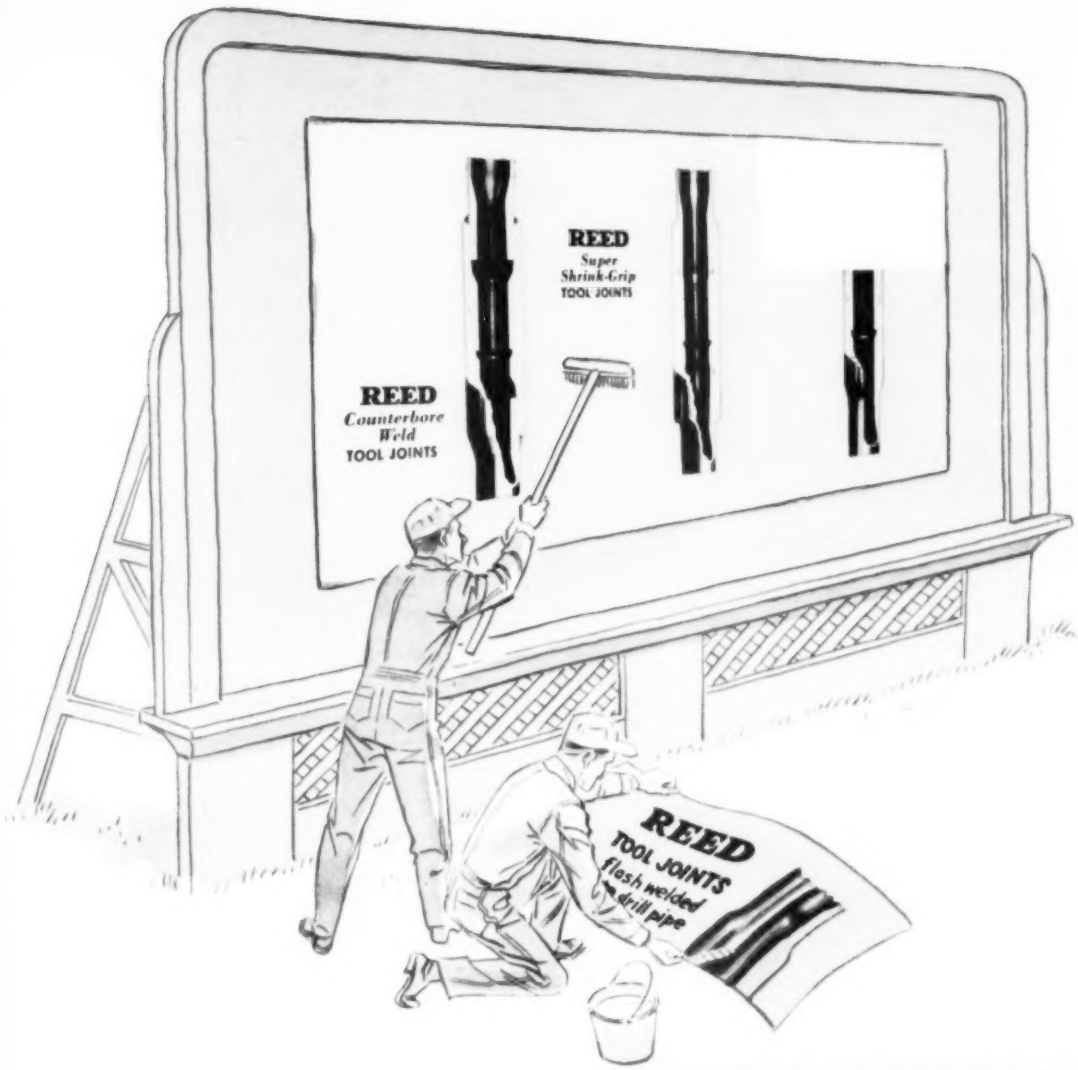

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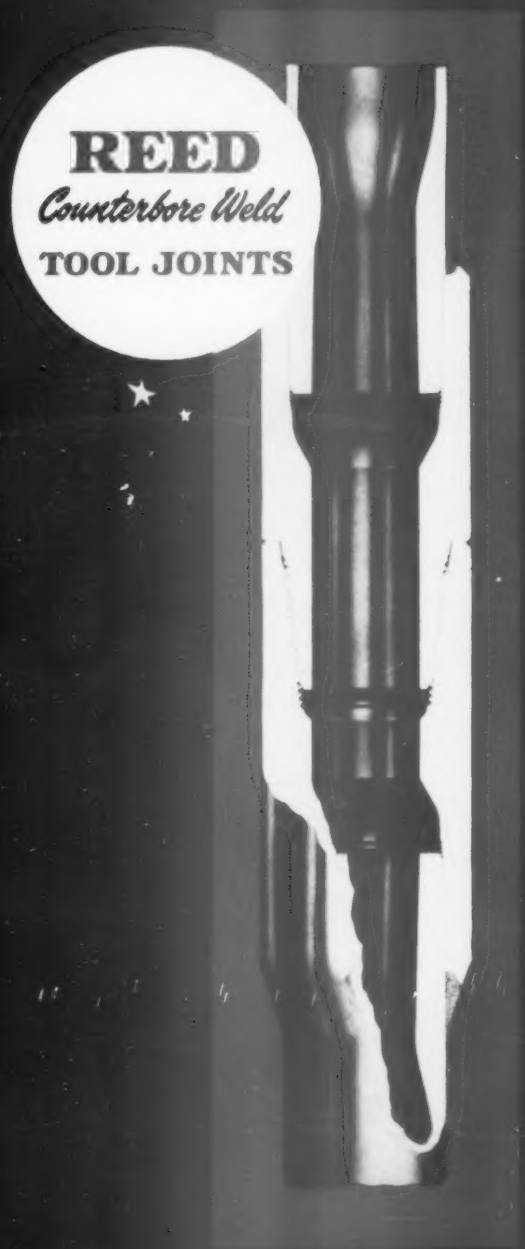

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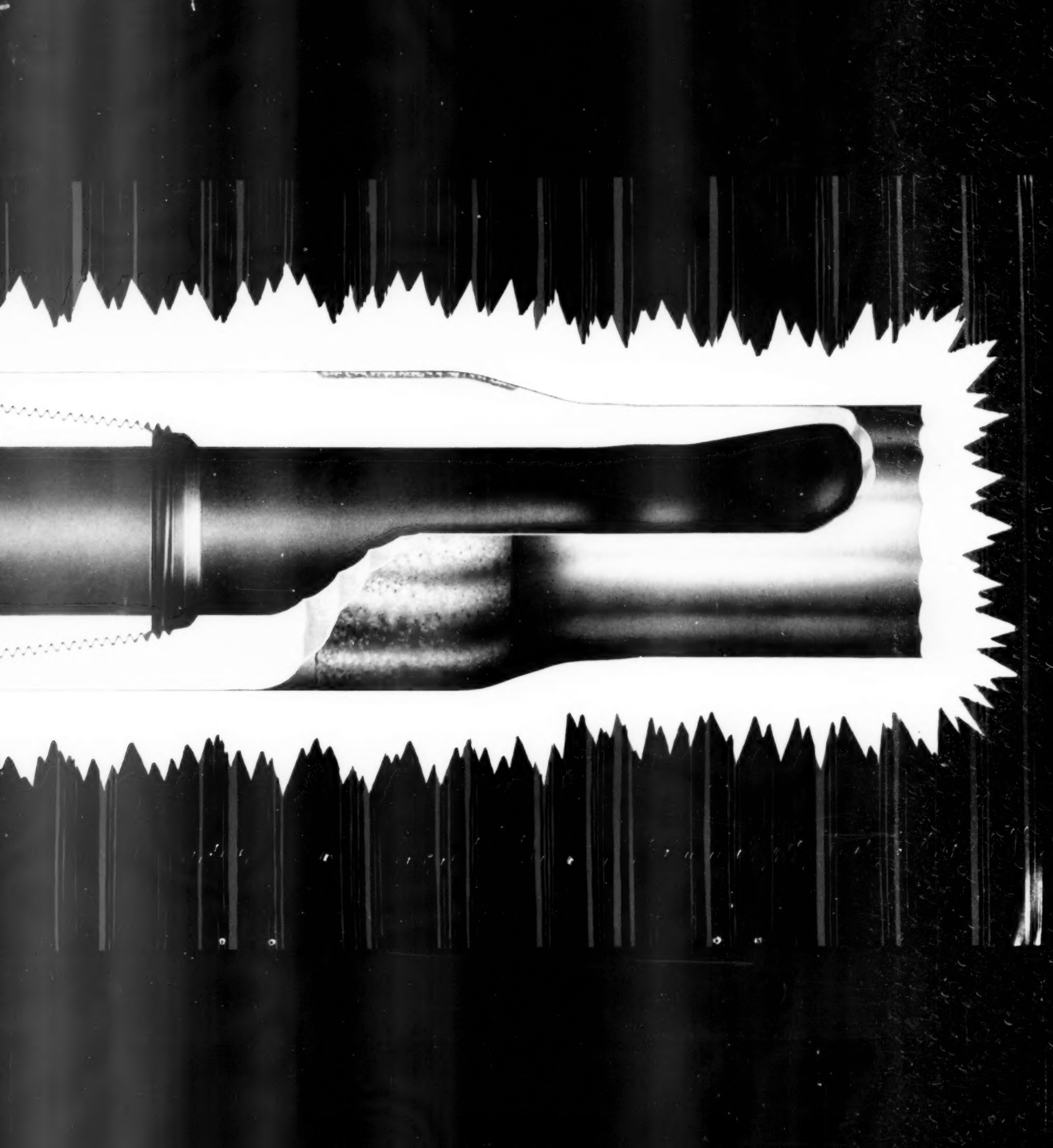

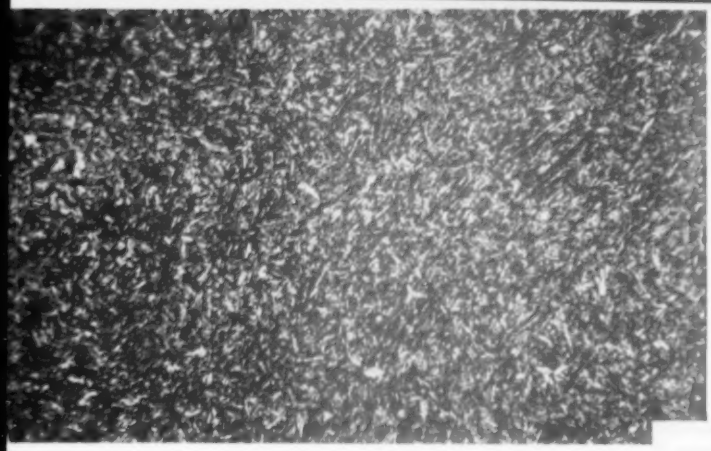

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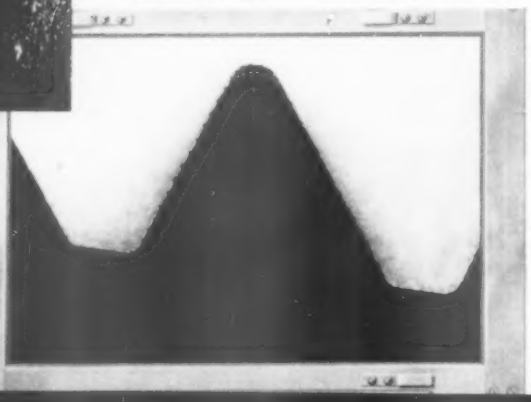


3951

Millions of Barrels More Oil for Healdton Field

(Continued from page 100)

lated by deducting nonrecoverable oil (29 per cent of the pore volume) from the original stock-tank oil in place.

The total stock-tank and mobile oil originally present in the several Healdton sands as calculated by a summation of lease totals is as follows:

	Thousands of bbl.	
	Original stock-tank oil	Original mobile oil
Upper three Healdton sands	590,448	369,765
Fourth sand	57,026	35,455
Stray sands	26,721	16,780
Total	674,195	422,000

Gas Injection at Healdton

Gas has been injected into 26 wells on 16 leases as a means of increasing oil production or of storing excess gas for later use. The first gas-injection operation was begun in 1928 on what is now Shell Oil Co. Lucy Tubbee lease, and other projects have been initiated at various times since; the last being commenced in August 1948. On some leases the gas injection was discontinued after several months, but on one lease gas has been injected intermittently over a period of 14 years. Currently gas is being injected into wells on six leases.

Denuded gas from the Harry Ells, Inc., gasoline plant comprises most of that injected, although some additional gas has been purchased from Oklahoma Natural Gas Co. On a few leases air was injected at the beginning of the operation and then later augmented with gas.

It is estimated that between May 1928, when injection was started, and December 1950, approximately 285,400 bbl. of oil was recovered from nine leases as a result of gas injection. Results on three other leases, where gas was injected primarily for storage, were inconclusive. On the 12 leases only 168 wells on 678 acres showed increases in the rate of oil production attributable to gas injection, as compared to the 1,971 wells and 7,142 acres in the field. On many leases the drilling of additional wells during the gas-injection program has masked the effects of gas injection.

Oil Reserves

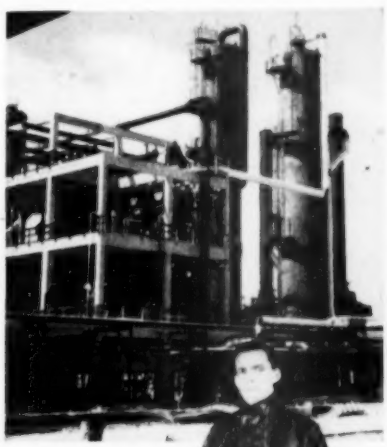
Earlier it was stated that the volume of mobile oil originally present in the Healdton sands (measured at stock-tank conditions) was approximately 422 million barrels. To January 1, 1951, about one-half of this mobile oil had been recovered.

Because in most of the wells, oil was produced simultaneously from several sands, it is impossible to calculate what fraction of the 211 million barrels of produced oil was recovered from the separate sands, and by deduction, how the remaining mobile oil is distributed among the several sand zones. Much of the oil undoubtedly was produced from the first developed and more extensive upper three sands, but probably 180 to 200 million barrels of mobile oil still remain in these sands. Reserves in the naturally water-flooded fourth sand zone are comparatively less important.

Producing Mechanism

The economic recovery of oil reserves remaining in the Healdton sands depends upon the type of mechanism which displaces oil from the pore spaces, and upon the pressure differentials available to move it through the reservoir sand into the well bores. It is well recognized that the mobility, or freedom with which oil will move through the sand, depends upon the oil saturation of the sand and upon the viscosity of the oil, and that as oil saturation decreases and viscosity increases, more pressure is required to move oil through the sand to the producing wells.

In the upper sand reservoirs, relatively inefficient solution-gas expansion



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was the displacement mechanism, and since little if any of the original reservoir pressure now remains, only that relatively small pressure differential created by vacuum application and gravity is now acting to move oil to the wells. The rate of production is decreasing yearly, and the history of wells and leases producing from the upper sands clearly indicates that much mobile oil will not be recovered unless some extraneous pressure is applied to the reservoir to move oil to the producing wells.

In most areas of the fourth sand a natural water drive is supplying the mechanism and pressure necessary to effect an efficient recovery of mobile oil reserves. Calculations made for one lease showed that the efficiency of this natural water drive in recovering mobile oil from the fourth sand, was about 84 per cent, as compared to a calculated efficiency of less than 50 per cent for depleted upper sands without benefit of water displacement.

Water Flooding

The principal purpose of this report is to encourage the recovery of these oil reserves by outlining methods and problems involved in their production. The injection of water into partly depleted oil-bearing sands simulates a natural water drive and is the most efficient secondary-recovery method in common use. By careful consideration of the many factors involved and control of the injected fluid, water flooding can be used to recover much additional oil from the Healdton sands.

Buckley and Leverett[3] in describing the mechanism of water flooding have stated that during an initial phase the water saturation in the sand increases rapidly and oil is ejected ahead of an advancing water front. During a subordinate phase both oil and water flow through the sand with a gradual increase in water saturation, so that water flows more readily and effects the removal of comparatively small and continuously decreasing volumes of oil.

Leverett and Lewis[4] have shown that in unconsolidated sands the relative permeability to either oil or water depends primarily upon the saturation of that phase. Their experiments were made on unconsolidated sands and their quantitative results are exact only for loose sands. Inspection and analyses of core samples indicate that many of the Healdton sands are loose or poorly cemented. In the absence of definite relative permeability data on the Healdton sands, it is assumed that with care and within certain limitations the data of Leverett and Lewis can be applied to many of the sands in the Healdton field to indicate relative permeability.

The mobility of a liquid depends upon the relative permeability of the sand to that liquid and upon its viscosity. Dykstra and Parsons[5] have defined mobility as the ratio of a liquid's relative permeability to its viscosity. The mobility ratio, the comparative ease with which two liquids will move through a sand, depends directly upon the relative permeabilities of the sand to those liquids and inversely upon the viscosities of the liquids. If the ratio of the mobility of the water to the mobility of the oil is less than one, a bank of oil is formed ahead of the water when it is injected into an oil sand.

In an attempt to apply mobility ratios to water flooding of the Healdton oil sands, Fig. 2 was constructed to show the limiting initial oil and water saturations which, at representative viscosities, would result in a mobility ratio of 0.9. A mobility ratio of 0.9 instead of 1.0 arbitrarily was selected to provide a safety margin of oil saturation which would assure the formation of an oil bank ahead of injected water.

Curves "A," "B," and "C," (Fig. 2) show the minimum oil and maximum water saturations permissible to water flood Healdton sands successfully under assumed flooding conditions.

Curve "A" is the limit of liquid saturations in per cent to permit a mobil-

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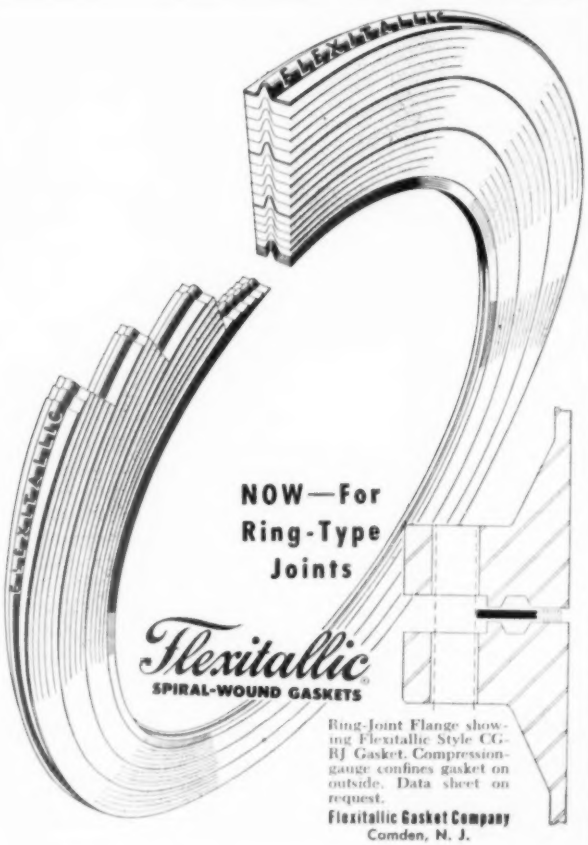

Ring-Joint Flange showing Flexitallic Style CG-RJ Gasket. Compression-gauge confines gasket on outside. Data sheet on request.

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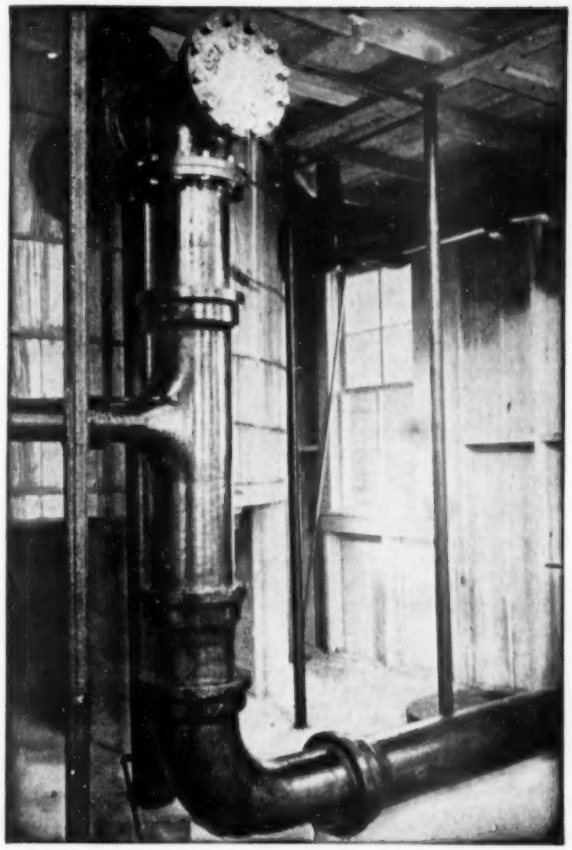

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ity ratio of 0.9 for an oil viscosity of 8.1 cp. and a flooding water viscosity of 1.1 cp. This combination of oil and water viscosities is considered to include the widest range of floodable liquid saturations possible in the Healdton field. Curve "C" marks the limit of liquid saturations for an oil of 34.0 cp. viscosity and a flooding-water viscosity of 0.8 cp. which would include the narrowest range of permissible liquid saturations in Healdton field. Curve "B" represents the limiting liquid saturation conditions for the average oil in Healdton field, oil 13.3 and water 1.0 cp.

In Fig. 2, the shaded areas bounded by the three curves, "A," "B," or "C," are those areas which contain the combinations of water and oil saturations which in the Healdton sands could be flooded successfully. The area above any of these curves included saturations unfavorable for water flooding; oil saturations too low or water saturations too high to permit the formation of an oil bank.

Sources and Treatment of Water

In considering water flooding of oil sands in the Healdton fields an adequate volume of water for injection probably would be the most important problem. Streams draining the Healdton field area are not large enough to provide the volume of water necessary for successful flooding operations. Possibly a combination of several sources of water could be used to obtain the volume of water required.

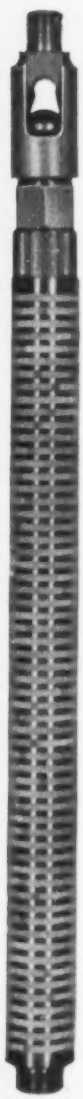
Many of the wells drilled in the field penetrated a number of upper Permian sands that were reported by the driller as water-bearing. Water for the city of Healdton in 2-4s-3w and for many lease operations is obtained from these shallow Permian sands at depths between 175 and 400 ft. The city water-supply wells showed initial production rates ranging from 500 to 1,000 bbl. per day. It is problematical whether such volumes of water could be produced continuously by these wells.

The analyses indicate the Permian sand water could be injected into the Healdton sands with comparatively little chemical or physical conditioning, in a water-injection system completely closed from the atmosphere. Because of a fairly high oxygen content, and low supersaturation of carbonates, it might be necessary to use an inhibitor to minimize corrosion. Even in a closed water-injection system it is likely that the Permian sand waters as produced would contain organic matter, and an algaecide or bactericide should be used, particularly in warm weather to prevent plugging in the injection wells.

Although considerable water is produced with the oil in Healdton field the volume of the water produced on any lease would not in itself be adequate for a regular water-flooding projcet. Produced water from several leases might be gathered at a central point to constitute a major portion of the water requirements for a small flood. For instance, in the northwestern part of the field about 4,400 bbl. of water is produced daily from 21 leases. This volume of water might be sufficient to flood a sand, 30 ft. thick, on one 80-acre lease.

Analyses of two samples of brine produced from Healdton sands in separate areas of the field show them to contain comparatively large quantities of dissolved iron, free carbon dioxide, and carbonate supersaturation. Because of changing conditions of temperature and pressure accompanying production and injection, it would be almost impossible to maintain these components in solution. In a closed water-injection system they might be precipitated and plug the formation. An open water-injection system permitting complete aeration and settling would be more satisfactory.

A brine sample produced from an Ordovician formation in a well 3,900 ft. deep has been analyzed. When this well was drilled in 1924 a large volume of water was reported in the formations below the present depth, and



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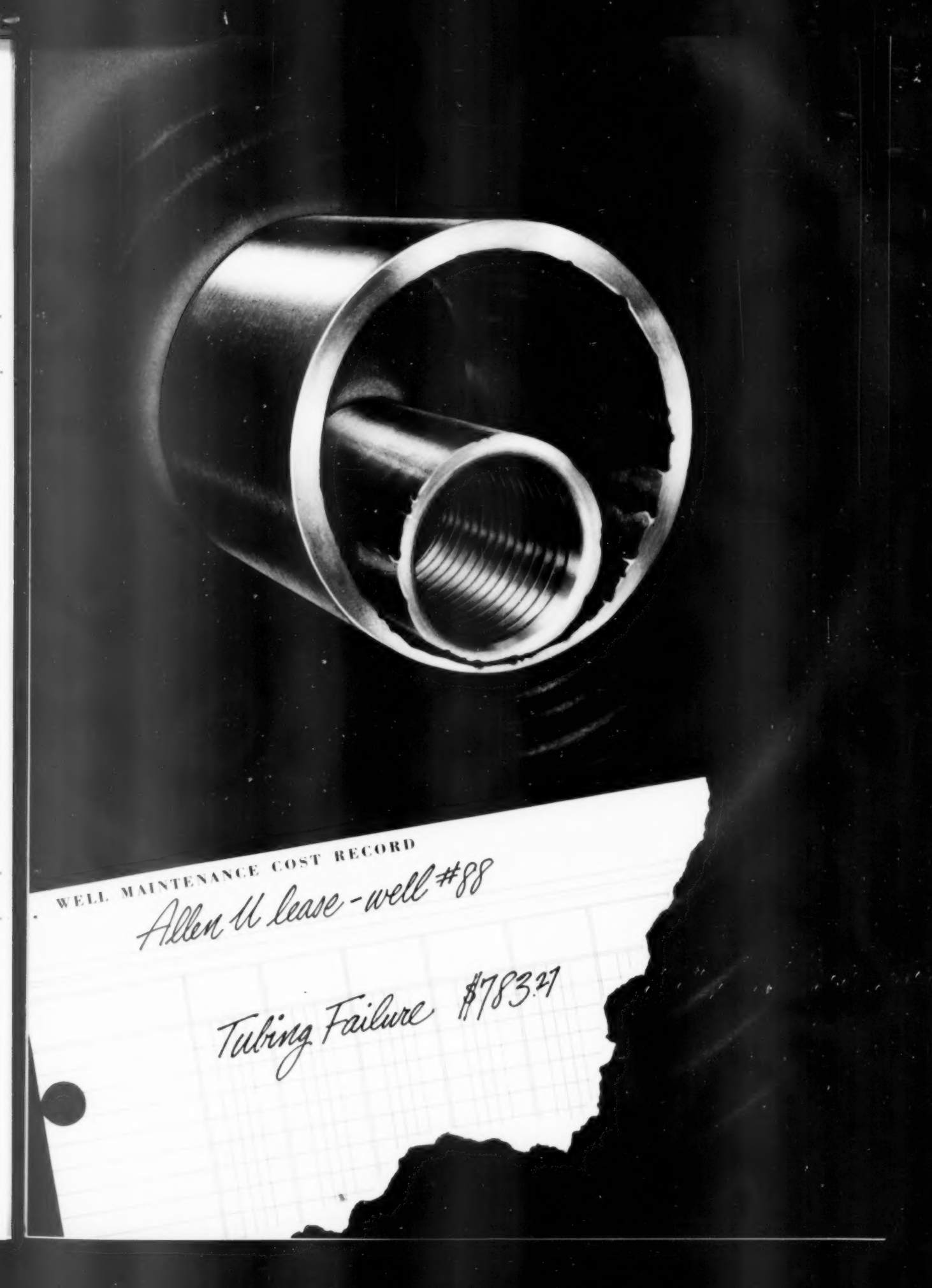
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the well was plugged back. Water from this lower formation would be suitable in water flooding of the Healdton oil sands, provided it is properly treated before injection. The possibility of using waters from Ordovician formations as a supply source should be investigated further.

Methods of water treatment in use in Mid-Continent fields are described in a recent Bureau of Mines report of investigations.[6]

Water-Flooding Calculations

Suder and Calhoun have presented a method for predicting the water-flood behavior of a property from core-analyses data and water-injection pressures.[7] Their method assumes that water flooding progresses in a horizontal plane with no vertical movement and that the total water flowing in a formation, including beds of different permeabilities, can be represented by the sum of the volumes of water flowing in the individual beds. An adaptation of this method, assuming a constant injection rate, was used in calculating the probable water-flood behavior of a sand underlying one lease in Healdton field.

These calculations were based upon a uniformly spaced five-spot pattern with four input wells surrounding each producing well. The fraction of the total five-spot area theoretically swept by the injected water, when it first reaches the producing well, is 0.72 as described by Muskat[8], and this value was used in the calculations as the theoretical sweep efficiency. After injected water from each bed first reached the producing wells, it was assumed that water and no oil would be produced from that bed, whereas in actual practice some oil is continuously produced with increasing volumes of water until a residual-oil saturation of 29 per cent is reached. When the oil saturation in the more permeable beds is reduced to 29 per cent or less, these beds might permit the movement to the producing wells of disproportionately large volumes of water, so that when the total volume of water pumped becomes too great to be handled economically, only in the more permeable beds would the oil saturation be reduced to the theoretical minimum. Selective plugging or packing off of these "watered-out" beds then would be necessary to effect oil recovery from the other, less permeable sands.

Based upon the amount of flooding water which might be available, an injection rate of 500 bbl. of water daily into each input well was assumed.

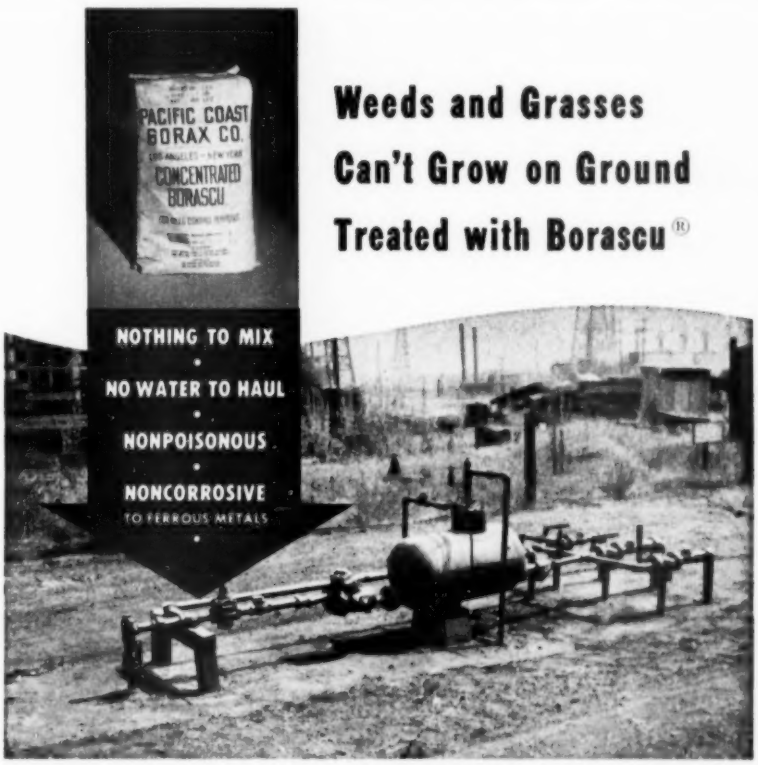
Calculations were made for a lease where the thickness of the upper member of the first Healdton sand averaged 34.7 ft. at a depth of approximately 900 ft. Analyses showed that the permeability of the individual core samples ranged from 400 to 3,100 md. and the porosity from 18 to 38 per cent. For the calculations a spacing between like wells of 660 ft. was assumed.

The entire sand body was considered as 17 individual homogeneous beds varying in thickness from 0.9 to 3.6 ft., and each bed was assumed to have uniform horizontal permeability with values for the different beds ranging from 450 to 3,000 md.

It was calculated that during the life of the flood, 500 bbl. of water daily could be injected into the sand body at pressures exerted by a hydrostatic head of water in the input wells.

An average oil and water saturation of 35.0 and 14.2 per cent respectively before flooding was used for each individual bed. The relative rate at which the injected water entered each individual bed was assumed to be proportional to the ratio which the millidarcy-foot capacity of that bed bore to the total capacity of the sand.

The volume of water necessary to effect flood-oil production is that volume required to saturate the gas space, and



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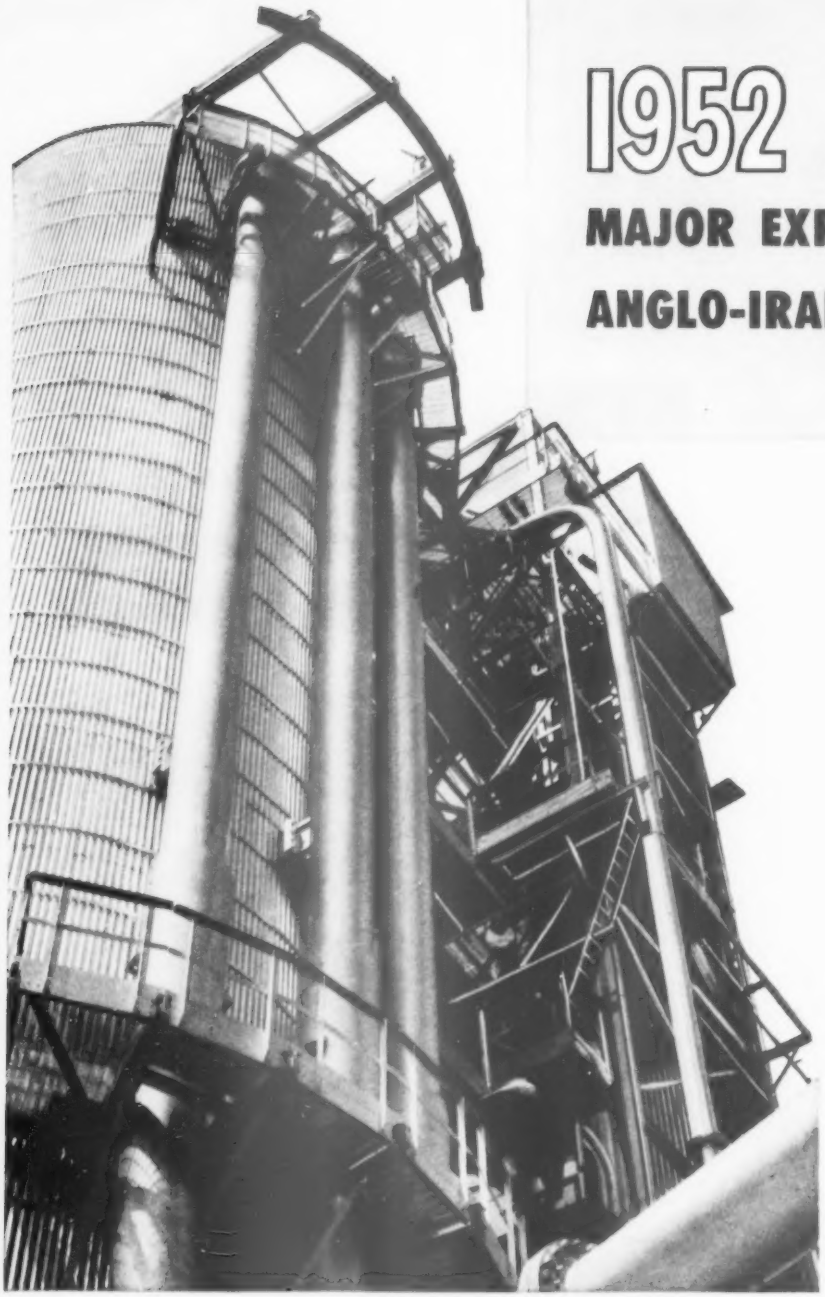

This distillation unit—Europe's biggest—is part of the Kent Oil Refinery, Anglo-Iranian's largest new plant since the Abadan shutdown.

1952 A YEAR OF MAJOR EXPANSION FOR ANGLO-IRANIAN

Anglo-Iranian's gross profits and sales in 1952—the first full year with no oil from Iran—were roughly comparable to 1949 with full oil supplies from Iran. This evidence of the company's resilience and resources, however, should not obscure the heavy impact of nationalization by Iran; without it sales volume in an expanding world oil market would have been much larger. Net profit was slightly above 1951 despite heavy capital expenditures necessary to maintain the company's position in the highly competitive world petroleum industry. Last year Anglo-Iranian spent over $160,000,000 on expansion and in 1953 plans to spend about $210,000,000, chiefly on tankers and refineries. Early in 1955 the company will have a daily refining capacity of about 600,000 barrels compared with about 366,000 barrels in 1952 and 640,000 in 1950 with Abadan in full operation.

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Sales

Despite the complete loss of oil from Iran, as against the 107,100,000 barrels exported during the first half of 1951, Anglo-Iranian's 1952 sales of over 670,700 barrels per day of crude oil and refined products were only 8.6 per cent below 733,600 barrels in 1951. This volume was achieved by expanding its own resources, by hiring refining capacity which processed a daily average of 62,900 barrels of its oil, and by purchasing nearly 146,700 barrels a day, mainly in the form of refined products. Purchases of crude oil were discontinued early in 1952, as Anglo-Iranian's own supplies from the Middle East were increased. Sales in the second half ran 11 per cent ahead of the second half of 1951, and sales in the early months of 1953 show an encouraging rise.

Crude Production

Anglo-Iranian's share of crude oil production in Kuwait, Iraq and Qatar increased during 1952 to 536,500 barrels per day, compared with 347,900 barrels from these sources in 1951. During 1953, this figure is expected to rise to about 733,600 barrels. AIOC 1952 offtake from Iraq was nearly doubled due to the commissioning of the new 30-inch pipeline from Kirkuk to the Mediterranean.

Refining

Chief items in the company's refining expansion are the 80,000 barrels-a-day Kent refinery near London, which started operating early in 1953, the 62,000 barrels Kwinana refinery in Western Australia, and the 100,000 barrels Aden refinery. The completion of these and the expanded output of existing refineries will give Anglo-Iranian by 1955 a total refining capacity of about 600,000 barrels per day. Not only will this allow for an appreciable extension of product sales, which in 1952 were about 460,000 barrels per day, but will provide a chain of refineries well placed to supply its markets throughout the Eastern hemisphere.

Tankers

The company's tanker fleet totals 151 ships of 1,934,000 deadweight tons. Under construction or on order are 27 ships totalling 618,000 deadweight tons, comprising 12 ships of 32,000 tons, 12 of 16,000 tons and three of 14,000 tons. The company continues to have about 2,000,000 deadweight tons of tanker shipping on charter.

Exploration

Exploration has been extended in various parts of the world—in Papua; in Nigeria; in Tanganyika and Zanzibar, where concessions have been obtained and surveys begun; in the Gulf of Paria, where test drilling is to begin; in Sicily, where surveys are encouraging; and in the Persian Gulf.

FINANCIAL HIGHLIGHTS

	1952	1951
Gross Trading Profits	£59,553,678	£71,377,882
Profit Before United Kingdom Taxation	£47,061,638	£52,217,016
Net Profit After Taxes	£25,165,966	£24,233,050
Dividends (including recommended final dividend)	£ 8,119,359*	£ 7,112,484

* Including recommended cash bonus.

Copies of the Annual Report and Accounts may be obtained from the Company's Representative in U. S. A., Mr. A. E. C. Drake, 610 Fifth Avenue, New York 20, N. Y.

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DISPUTE WITH IRAN

At the center of the nationalization dispute with Iran is the fact that Anglo-Iranian has been deprived of the benefit of extracting and disposing of Iranian oil for the remaining period of its 60-year Agreement of 1933 with Iran. Any award of compensation based on loss of company installations alone would fail to recognize this fact.

The Iranian Prime Minister has not only refused to take into account the loss of the 1933 Agreement but has asserted that the Agreement itself was invalid. This Agreement was the unchallenged legal basis for the company's operations in Iran for 18 years. On the strength of it, Anglo-Iranian made an investment in a foreign country of unprecedented magnitude. It was signed by the Iranian Government and ratified by the Iranian Parliament in full open session—an approval restated by the Iranian Government before the League of Nations.

No less than five major attempts have been made to settle the dispute. Three missions—from the company, the British Government, and the World Bank—made proposals which were rejected. Joint Anglo-American proposals in August 1952 were also rejected. Further proposals early this year were that (1) compensation be settled by the International Court of Justice on the basis of a United Kingdom Nationalization Law to be selected; (2) this point and method of payment agreed, the United States was prepared to make monetary advances to Iran to be repaid in oil; (3) Iran negotiate with an international organization—AIOC participating—to market her oil; and (4) the Court's award could be paid from Iran's future oil revenues, by deliveries of oil, or a combination of both. Thus Iran could have controlled her oil industry and discharged the compensation award largely, and perhaps entirely, by oil from the enormous reserves discovered by the company in Iran and by means of the highly developed productive facilities the company had installed there. These proposals, described by the United States as "reasonable and fair", were likewise rejected.

The Iranian nationalization laws of 1951 are not concrete measures for the effective payment of adequate compensation. They merely empower the government of Iran, *if it so chooses*, to deposit in a bank up to 25 per cent of future oil revenues for payment of such compensation as it may itself judge to be rightful and as the Iranian Parliament may approve, after deduction of Iran's as yet unspecified counter claims against Anglo-Iranian. Iran would become the sole judge both of its own claims and those of the company.

Iran has neither paid compensation nor agreed to a satisfactory basis for assessment and payment of compensation, and the practical effect of the laws has amounted to confiscation.

commonly is referred to as the "fillup" volume. This fillup volume can be calculated by the following equation:

$$V = 0.72\,D^2\,T\,P\,(1-C_w-O)\,0.178$$

Where:

V = Fillup volume, barrels.
0.72 = Theoretical sweep efficiency at water breakthrough for five-spot pattern.
D = Spacing between like wells, feet.
T = Thickness of bed, feet.
P = Porosity, decimal fraction.
C_w = Water saturation, decimal fraction.
O = Oil saturation, decimal fraction.
0.178 = Factor converting cubic feet to barrels.

If after fillup, 1 bbl. of injected water displaced an equal volume of oil to the producing wells, the total volume of water required to reduce the saturation of the bed to 29 per cent in the area theoretically swept, would be the fillup volume plus 4.32 per cent, 0.72 (35-29), of the total pore volume of that bed.

Based upon these data and assumptions it was calculated that the first flood oil would reach the producing well about 11 months after the injection of water was started. The peak rate of oil production probably would occur about 6 months later. It was calculated that the life of the flood to an economic limit of 1 per cent oil in total fluid would be about 7 years, and that during this time approximately 3,470 bbl. of oil per acre would be recovered from this sand.

Because early in the life of the flood several of the more permeable beds would be depleted of oil and would be producing mostly water, provisions should be made to handle comparatively large volumes of water.

The above calculations are exemplary only and the results should not be construed as predicting the actual waterflood behavior of any particular lease. These data and discussions (summarized from Bureau of Mines Report of Investigations 4917) are presented to encourage oil operators to examine the water-flooding possibilities of leases in Healdton oil field.

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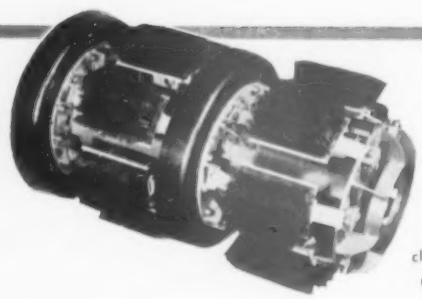

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BOOK

THE WORLD'S OILFIELDS.—The Eastern Hemisphere. Edited by V. C. Illing. Published by Oxford University Press, 114 Fifth Avenue New York. 174 pp. $20.

In this book, which is Volume IV, Part 1, of The Science of Petroleum, 30 geologists present information on the oil fields of the Eastern Hemisphere. Its four sections comprise Europe (other than Russia and parts of eastern Europe), the Middle East, and Far East (including Australasia), and Africa, and within each section the various countries are covered by separate contributions. Bibliographies and numerous maps and figures are included. One of the problems which had to be faced in dealing with scattered areas was the coordination of the separate descriptions so as to present the subject matter within a general geological framework, indicating the relationship of one area to another, and filling the gaps which must inevitably arise as a result of the scattered nature of the oil fields.

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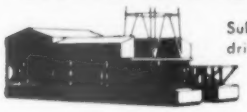

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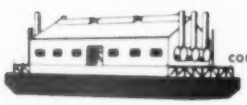

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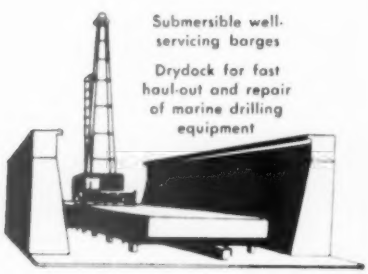

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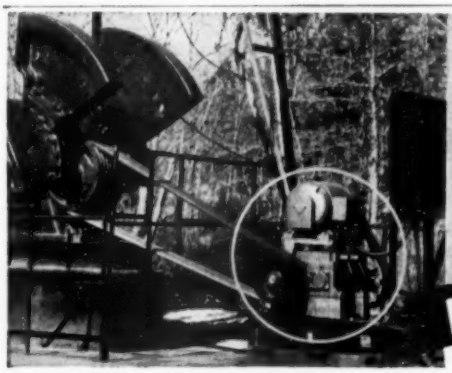

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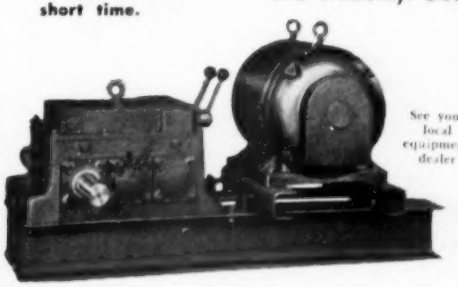

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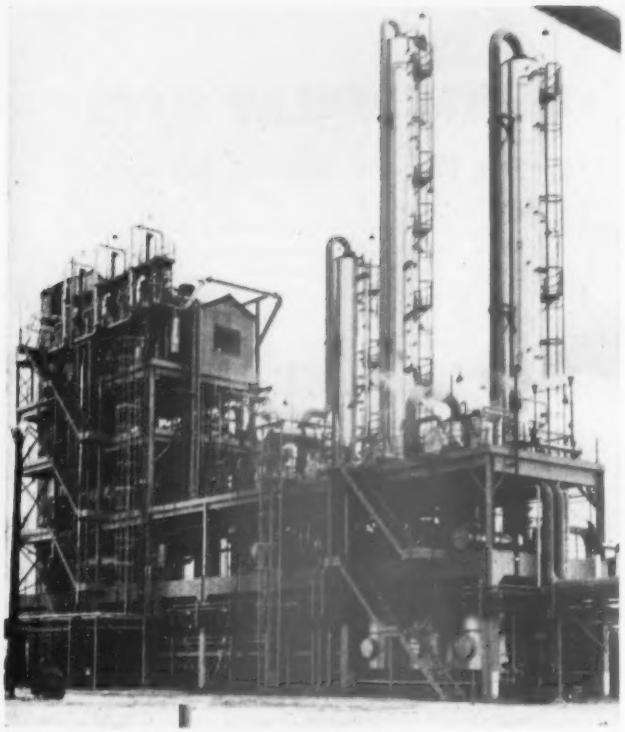
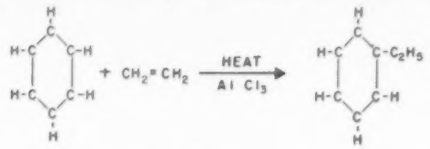


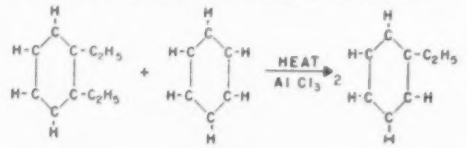
THE PLANT AT PORT ARTHUR . . .

① THE BASIC REACTION IS THE FRIEDEL-CRAFTS ALKYLATION:



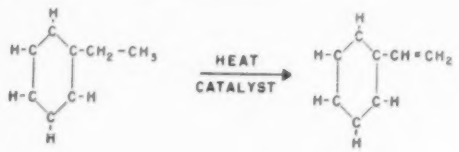
BENZENE ETHYLENE ETHYLBENZENE

② THE DEALKYLATION OF POLYETHYLBENZENES IS TYPIFIED BY CONVERSION OF DIETHYLBENZENE AS FOLLOWS:



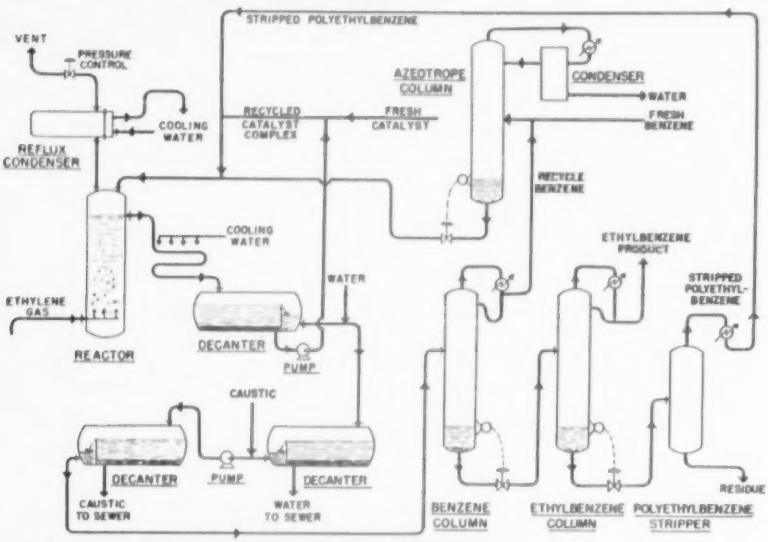
DIETHYLBENZENE BENZENE ETHYLBENZENE

③ THE CONVERSION OF ETHYLBENZENE TO STYRENE AT THE KOBUTA PLANT IS AS FOLLOWS:



ETHYLBENZENE STYRENE (VINYLBENZENE)

. . . THE CHEMISTRY OF THE PROCESS



. . . AND THE PROCESS FLOW DIAGRAM

PETROCHEM REPORT

Koppers Makes Ethylbenzene At Port Arthur Plant

by F. Lawrence Resen
Gulf Coast District Editor

AN unusual raw material-transportation setup is one of the features of Koppers Co., Inc.'s, ethylbenzene plant located near Port Arthur, Tex.

This newest addition to the Gulf Coast petrochemical industry *(The Oil and Gas Journal, March 4, 1953)* synthesizes ethylbenzene by the normal Freidel-Crafts reaction, which intermediate chemical is then used by Koppers for the synthesis of styrene and polystyrene at its Kobuta, Pa., plant.

Basic raw materials—ethylene and benzene — were available to Koppers from two widely separated sources; Gulf Oil Corp.'s recently completed ethylene plant at Port Arthur could supply the former while eastern and southern coke plants provided the benzene required.

Koppers' management reviewed the economic factors entering into the case and came up with this solution: build the plant adjacent to Gulf's ethylene installation, ship benzene by barge down the Mississippi, and then use the same barges to ship the ethylbenzene to the Kobuta plant for further use.

The Williams plant has been designed to produce approximately 90 million pounds of ethylbenzene per year. However, early operation indicates that the plant will actually be capable of producing at 115 per cent of rated capacity. The plant was built by Koppers' own engineering and construction division.

CONTROL ROOM of Koppers' ethylbenzene plant at Port Arthur, Tex.

Process . . . Koppers combines ethylene and benzene to form ethylbenzene by the normal Friedel-Crafts reaction employing aluminum chloride as catalyst. Dry high-purity benzene, recycled polyethylbenzenes, and recycled aluminum chloride complex are combined in a joint stream and fed continuously into the top of a reactor of acid-proof construction. A continuous stream of ethylene gas enters the bottom of the reactor and it is in this vessel that conversion to ethylbenzene is achieved.

Acid alkylate overflows from the reactor to a complex decanter tank where the majority of the aluminum chloride complex settles out and is recycled, along with fresh makeup, back to the combined stream entering the reactor.

The acid alkylate passes through a decanter system where caustic is inserted into the stream to neutralize the alklyate which is then charged to the benzene column. Unreacted benzene is taken overhead from this column and combined with fresh benzene for injection into the azeotropic drying column from which it is recycled to the reactor.

Bottoms from the benzene column are charged to the ethylbenzene column where high-purity ethylbenzene is recovered overhead. Polyethylbenzenes from the bottoms are flash-vaporized to separate from heavy residues and returned to the reactor with additional benzene for dealkylation to ethylbenzene.

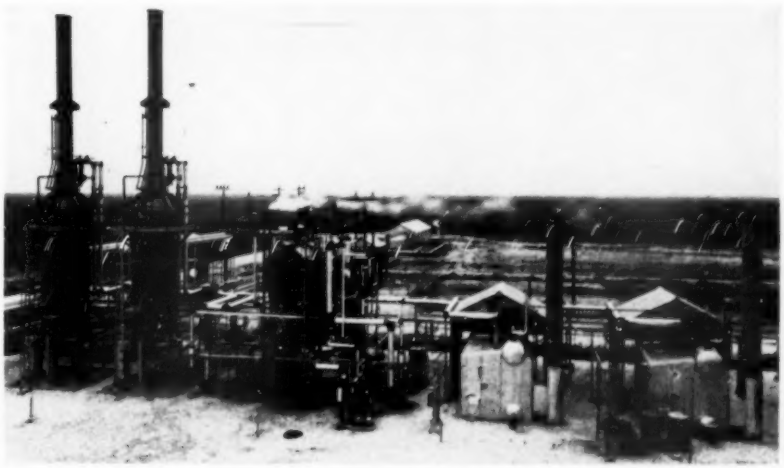
The alkylation step is composed of several reactors and permits considerable freedom in decision of combined or separate processing of polyethylbenzenes and virgin feed stock.

The ethylbenzene thus produced is shipped to Kobuta, where it is dehydrogenated to styrene (vinylbenzene) and then polymerized as required to polystyrene.

Background . . . Koppers operated the Kobuta styrene-butadiene plant for the Government during World War II. With the purchase of the styrene facilities at the end of the war, Koppers' chemical division became one of the major producers of styrene in the country. Installation of large-scale facilities shortly afterwards raised the Kobuta works to the position of a major polystyrene plastic producer also.

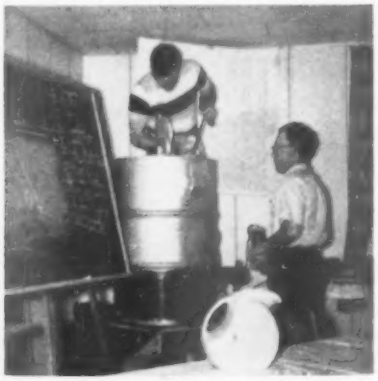
Expansion of both styrene and polystyrene facilities in the past several years has maintained Koppers as major producers of these two widely used materials. It is in conjunction with this rapid expansion in styrene requirements that the Williams plant was built.

Plant personnel . . . Key personnel at the Port Arthur plant include: H. E. Roche, plant manager; Edward H. Tenthoff, assistant plant manager; C. A. Kozelski, personnel manager; A. M. Miller, departmental foreman in charge of production; R. L. Iverson, chief chemist; J. P. Cassidy, Jr., maintenance-department foreman.



AUXILIARY EQUIPMENT at the Williams plant of Koppers Co., Inc.

GAGER'S accuracy is most important in preventing loss of company's oil.



GAGERS' meetings, held regularly to teach proper gaging methods, emphasize accuracy. They are major factor in cutting losses.

How one firm is cutting losses of oil in transit

LOSSES of products and crude oil in transit have been cut appreciably with establishment of a "Stock Control Section" by Standard Oil Co. (Ohio).

Before the plan was set up, the firm, in 1 year alone, lost 252,000 bbl. of crude oil worth $707,000. However, with the new department keeping close track of all oil, losses last year were down to $69,200 for products, and $280,000 for crude.

Oil is still lost at every transfer point, either through evaporation from tanks, leaks, inaccurate meters and gaging equipment, or human error, however.

How control works . . . Time is a vital factor in finding cause of losses. Discrepancies went unnoticed formerly until monthly statistics of handling were compiled about the 12th of the following month. By that time it was hard to make a complete analysis of the operation where the shortage occurred.

A system of daily controls was set up whereby gagers take inventory at a specific time each day, and report the movements they handled during the preceding 24 hours. This report is made by telephone or radiotelephone.

The gager reports his gagings in every tank before and after each delivery and receipt of oil, plus other factors such as basic sediment and water content, temperature, and gravity. He also shows stock on hand and other factors, such as leaks, truck crude in transit, etc., which might affect the figures.

Stock-control personnel summarize his receipts, deliveries, amount to account for (stock that should be on hand), stock actually on hand, overage or shortage. They keep a running record of overages and shortages. When a large loss shows up on a gager's report, the stock-control office can often deduce what has happened.

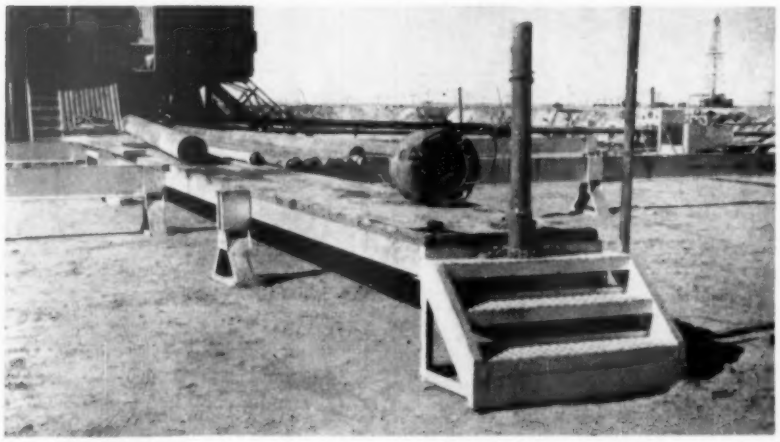
The stock-control people also get pressure and flow charts from pipe-line pumping stations, and use them to figure out the amount of oil pumped through the lines to see if it tallies with quantities arrived at in tank gaging.

One of the major accomplishments that is reducing losses is the periodic "refresher" training meetings instituted for gagers throughout the department.

(Courtesy The Sohion, publication of Standard Oil Co. (Ohio).

SAMPLES must be analyzed accurately to determine b.s., water content of oil, to assure correct measurement.

STOCK-CONTROL clerk receives daily reports from gagers via telephone or radiotelephone, keeps account of oil movement.



RACK can be extended to any length on either side of walkway.

DETAIL of "A" frame support.

Versatile Pipe Rack

It can be extended to any length on either side of its walkway; sills are made of wide-web structural "I" beams

A PIPE rack which can be extended to any length on either side of a walkway by adding duplicate sills on the ends is now in use by Great Western Drilling Co. of Lubbock, Tex.

Used with company's Rig 12, the rack is versatile and can be set up to fit any particular need.

The sills are made of wide-web structural 'I' beams cut to convenient handling lengths. Each sill is exactly the same length of the first sill.

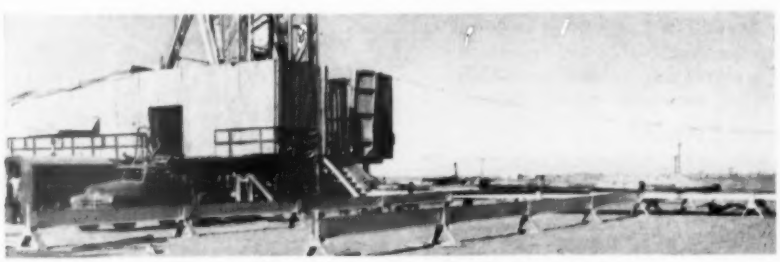
Supports . . . Supports for these sills are triangular-shaped "A" frames, made of wide-channel iron, with the diagonal risers having the channel facing inside. The base is a slightly wider piece of similar material to permit the lower ends of the diagonal risers to fit snugly into the channel of the base which operates with the channel looking up.

The apex of the risers is fitted with short sections of channel iron, similar to that employed as the base, and welded to gusset plates which in turn are welded on both sides of the risers where they join each other. The top of these short sections of channel iron are tied to each other with narrow sections of flat steel and welded securely to prevent separation when carrying a load of drill pipe or casing. These open-side box-type sections of channel iron at the apex of the A frames are meticulously measured for exactness for the side opening so they will receive other locking devices when the rack is being erected.

Each end of the similar sills is fitted a steel plate, welded flat against the end and carefully trimmed so as to enter the open side of the adjacent riser. The lower end of this plate sets squarely against the top edge of the gusset plate welded to the apex of the A frame which carries the weight of the rack and load of tubular goods employed at the rig.

A back-stop to be used at the end of the rack when it has been erected is made of piece of I beam where the web has been cut lengthwise, and the flanges pass easily into the open end of the A frame open-end of the box-type upper section. These back-stops are used to prevent the last joint of pipe from rolling from the rack to the ground.

Walkway . . . The walk is constructed of wide-web channel iron for side sills, and made into two identical sections of conventional length. Three pair of structural-steel risers are used as supports for the walk which take cross members, from one side of the walk to the other, shaped and fitted to enter the open side of the box-type sections of channel iron at the apex. Therefore, the entire structure—pipe rack and the walk—becomes a solidly anchored installation which will easily withstand rough usage.



VIEW OF rack extended. Note "A" frame supports.

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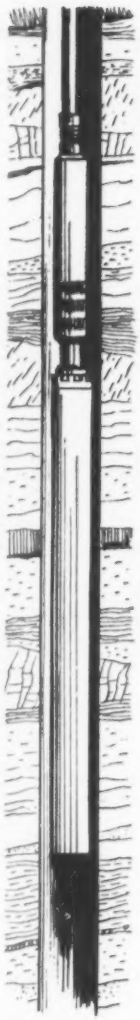

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REDA
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BARTLESVILLE, OKLAHOMA

by R. E. Maples*

THE JOURNAL'S WEEKLY
Engineering Reference
SECTION

Compressibility Factors for Natural Gas

COMPRESSIBILITY factors, employed in making gas calculations at high pressures, are usually estimated from a chart involving reduced (or pseudoreduced) temperature and pressure. For natural gases a set of charts has been prepared by Standing et al.[1] from which critical temperatures and pressures can be obtained in terms of the gas specific gravity.

The procedure has been simplified further by a series of charts prepared by Buthod.[2] Each chart presents the desired compressibility factor in terms of the existing temperature and pressure for a natural gas of a particular specific gravity.

Instead of plotting compressibility factor (Z) as ordinate and reduced temperature (T_R) as parameter, in the usual manner, Z has been plotted here as the parameter. This allows attachments of other plots to make a "runaround" chart. Reduced temperature and reduced pressure can then be determined graphically (a) in terms of gas specific gravity in the case of natural gases, or (b) in terms of critical temperature and critical pressure where a universal correlation is used for the compressibility factor.

The procedure for preparing the chart of Fig. 1 follows:

1. Data of Standing et al.[1] were cross-plotted with reduced temperature T_R as ordinate and reduced pressure P_R as abscissa, compressibility factor being the parameter.

2. Specific gravity was plotted as the parameter against temperature (abscissa) and reduced temperature T_R as ordinate. This plot was based on a pseudo-critical temperature versus specific-gravity chart published previously.[3]

3. A plot was made of pressure (ordinate) versus reduced pressure (abscissa), with specific gravity as parameter. This was based on a previously published chart[3] of specific gravity versus pseudo-critical pressure.

4. From the plot prepared in Step 3 it may be seen that specific gravity varies but slightly with reduced pressure. An average specific gravity of 0.8 was therefore used and a pressure scale substituted directly for the reduced-pressure scale employed in Step 3.

5. Plots prepared as above were then combined to give the chart of Fig. 1.

This chart gives compressibility factors with sufficient accuracy for most natural-gas-engineering calculations. A comparison of compressibility values obtained from this chart with methods cited previously has been made in Table 1.

*Consultant, National Petroleum Council, Rio de Janeiro, Brazil. Formerly with Phillips Petroleum Co. and University of Tulsa.

References

1. Standing, Katz, Brown, & Holcomb, Proc. twenty-first annual meeting of N.G.A.A., 1941.
2. Buthod, The Oil and Gas Journal, September 8, 1949, p. 79.
3. Bull. No. TS-461, C.N.G.A.

TABLE 1—ESTIMATING COMPRESSIBILITY FACTOR, Z

Specific gravity	0.63	0.63	0.80	0.80	0.80	0.90
Temp. (°F.)	120	120	20	60	450	60
Pressure (psia.)	1,000	3,000	500	2,000	2,000	2,000
T_c (°R.)[3]	368	368	424	424	424	458
P_c (psia.)[3]	670.5	670.5	665.5	665.5	665.5	662
T_r	1.58	1.58	1.13	1.23	2.15	1.14
P_r	1.49	4.47	0.75	3.00	3.00	3.02
Z factor:						
Present work	0.88	0.82	0.81	0.55	0.955	0.47
Buthod[2]	0.875	0.81	0.78	0.54	0.95	0.47
Standing et al.[1]	0.88	0.82	0.795	0.56	0.955	0.48

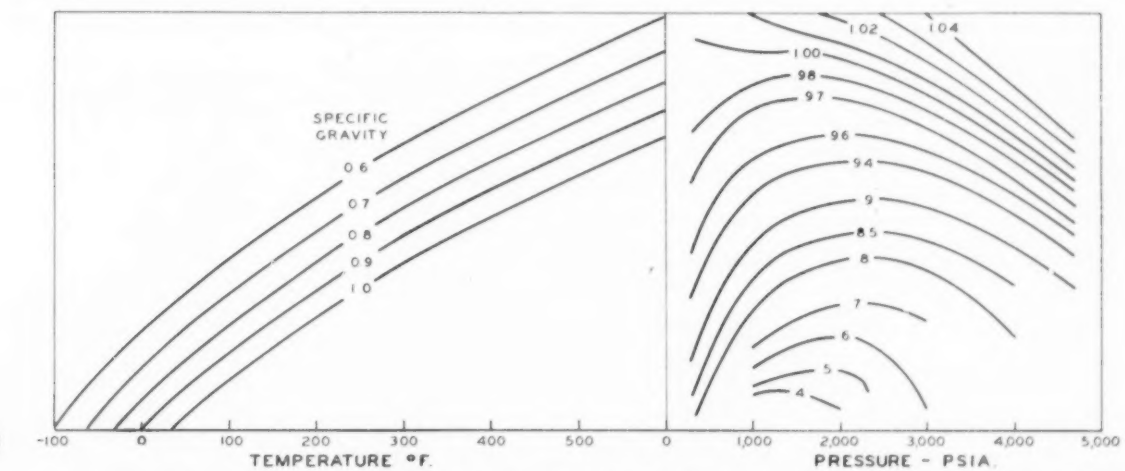

Fig. 1—EXAMPLE—Find compressibility factor Z at 60° F. and 2,000 psia. for a natural gas of 0.8 specific gravity. Read vertically from 60° F. to 0.8 specific gravity line, then horizontally to intersection with vertical line from 2,000 psia. Value of Z is 0.55.

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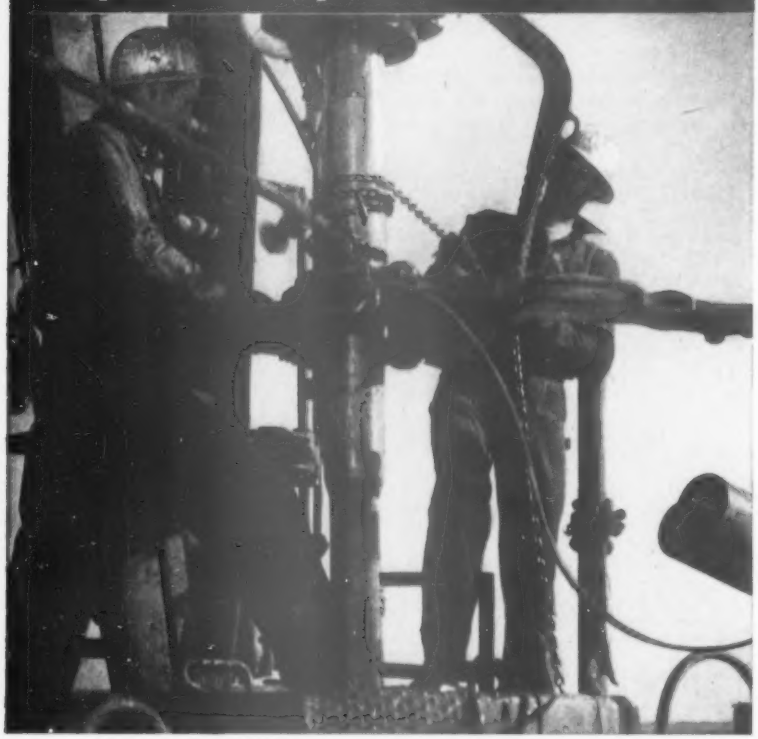

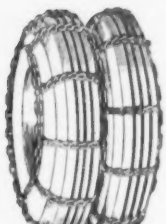

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Measuring Fluid Flow by Sound Waves

A NEW type of electronic flow meter, recently developed by the National Bureau of Standards, utilizes the change in velocity of sound waves as a measure of fluid flow. It has a very fast response and does not obstruct the fluid currents to make the measurement. In addition, the signal-to-noise ratio is sufficiently high to permit the measurement of extremely small velocities.

In the newly developed flow meter, a sound wave is transmitted over a fixed distance through the flowing fluid, and the phase of the received wave is compared with that of the transmitted wave. The sound energy is imparted to and taken from the fluid through the walls of the containing vessel. No part of the measuring system need come in direct contact with the medium under study. This characteristic of the system makes the unit applicable for the detection of the flow of chemicals in a closed system, for example, the coolant in a chain reactor. Minor modifications will permit the measurement of the flow of such fluids as gas or oil in a metal pipe.

Phase meter employed . . . A simple system utilizing merely a stationary device to transmit energy into the medium and another stationary unit to receive it would be impractical because changes in distance or propagation velocity would produce errors far greater than the variations due to flow. For this reason, the transmitter and receiver of the new flow meter are exchanged periodically without varying their locations. This is accomplished by using identical magnetostrictive or piezoelectric exciters, such as barium titanate crystals, as transmitter and receiver and by switching their connections alternately to the receiving and transmitting channel. Thus, the phase meter displays two phase shifts alternately, one a function of the sound velocity plus the fluid flow and the other a function of the sound velocity minus the fluid flow. The difference between the two phase shifts is a measure of the velocity of the fluid.

Mechanical switching . . . In the first model, a mechanical switching system operating at a 10-cycle per second rate is employed. The switching is achieved by a commutator that is inserted between the crystals on one side and a 100-kc. oscillator and receiver on the other. The oscillator is connected to an amplifier containing carefully designed limiters that produce a square wave voltage to be injected on one grid of a multigrid phase-meter tube. The receiver amplifier also furnishes a limited signal to the other grid of the phase-meter tube.

The output of the phase meter is applied to an electronic high-impedance volt meter (which can be calibrated directly in terms of velocity) through the rectifier-switch geared to the commutator drive. Fast velocity changes can be observed on the screen of a cathode-ray oscilloscope connected to the plate of the phase-meter tube. Thus, if the plate voltage is made visible, the difference between the voltages developed "upstream" and "downstream" can be used directly to estimate the flow velocity instantaneously.

Electronic switching . . . A modification to the commutation operation is the use of an electronic switch. By using vacuum tubes, the switching frequency can be increased to 1,000 cycles, for example, and the time of response can be correspondingly shortened. Four pentode amplifiers are placed between the crystals on one side and the oscillator and receiver on the other. The screen-grid supply is derived from a square-wave generator with a frequency equal to the switching rate (1,000 cp.). When the screen voltage is positive, the pentode acts as a normal amplifier; when the potential becomes negative, the electron stream in the tube is blocked and good shielding is provided.

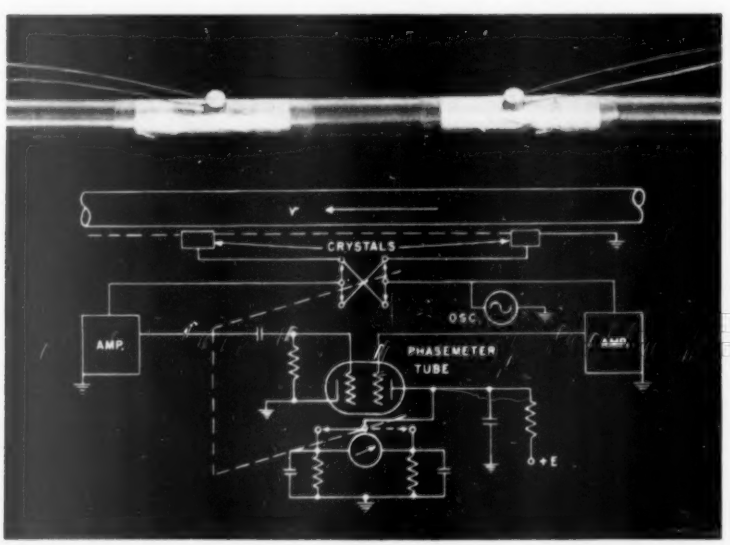

Fig. 1—New NBS flow meter showing crystal location (above) and circuit diagram.

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2. 20% greater interface area — more thorough and complete degassing.
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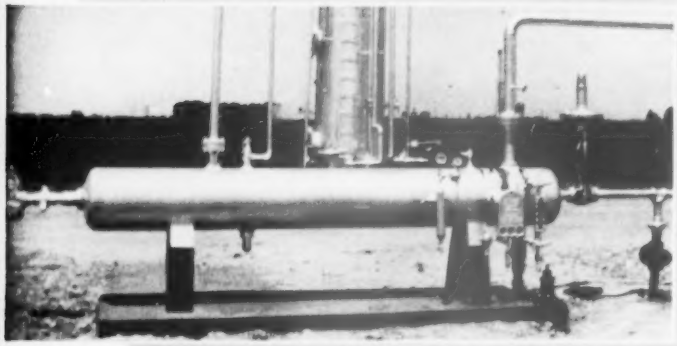

SINGLE STAGE SEPARATION: The Parkersburg large diameter single tube horizontal separator meets every demand for more efficient, more economical, larger volume separation. It does a far more efficient job of separating than comparable two tube separators.

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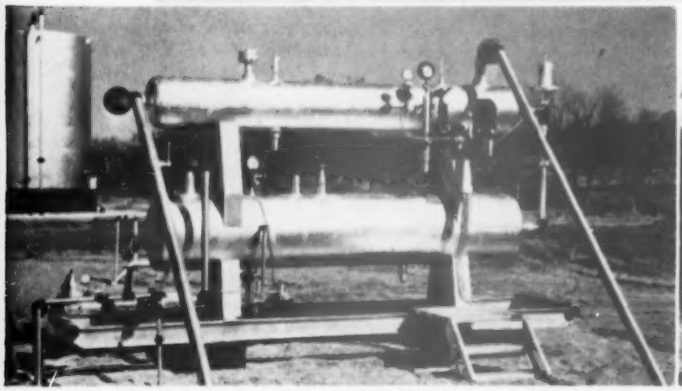
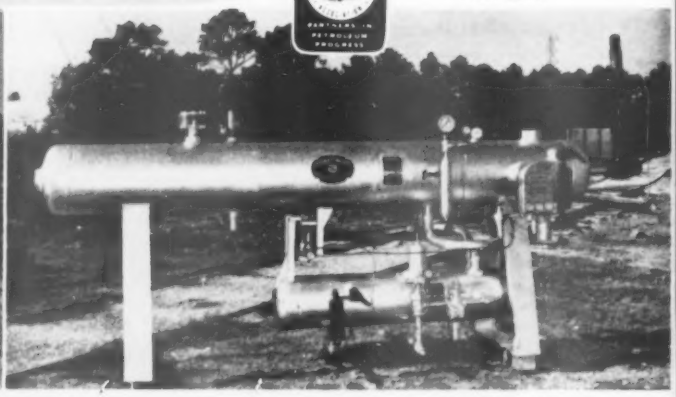


TWO STAGE SEPARATION: A standard Type "S" high-pressure separator mounted on top of the low-pressure separator gives the operator a highly efficient, compact, unitized two stage separation unit. These separators can be used individually simply by breaking down the assembly.



THREE PHASE SEPARATOR: The addition of the lower vessel from our standard Hydracepter Water Knockout to our standard Type "S" Horizontal Separator produces an effective three phase separator for removing free water.

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Stray-Current Corrosion*

IT is common practice with direct-current circuits to make use of ground as a return path for the current. Where such practices are encountered, the actual path of the current may stray some distance from a straight line between two points in a system. Even where metallic circuits are provided for handling these direct currents, it sometimes happens that the return current strays from the path provided and returns to the generator, either through ground or some metallic structure.

Because these currents have been found to stray from the desired path, they are commonly referred to as "stray earth currents" or simply as "stray currents."

Typical system . . . Fig. 17 is a diagrammatic sketch of an electrified street railway system, typical of d.c. systems. In this system, the direct current flows from the generator into the trolley wire, along this wire to the streetcar, and through the trolley of the car to the motors driving it. The return path of the current, to complete the circuit, is intended to be from the motors to the wheels of the car, which are in contact with the rails, so that the current can pass directly to the rails and return to the generator at the substation over these parallel tracks.

Because of the many mechanical joints along these tracks, all of which offer resistance to the flow of the electricity, what usually happens is that a portion of the current seeking an easier path to the substation, leaves the rails, passing into the ground, and returns to the substation through the moist earth, because it offers less electric resistance than the multiple joints of the track system.

If in the course of its journey through the ground to the substation it passes near buried steel pipe, the metal of the pipe, of course, offers even an easier path for return than does the ground around the pipe, and therefore, the current flows onto the pipe line and along the metal wall of the pipe to some point nearer the substation, where it will leave the pipe to flow through the ground back to the rail, and finally return to the generator in the substation.

The sections of pipe line along which current is flowing from the ground to the pipe are spoken of as negative areas. Sections where these currents are leaving the pipe to travel through the ground are called positive areas.

*Taken from A Manual on Underground Corrosion, Columbia Gas System Service Corp.

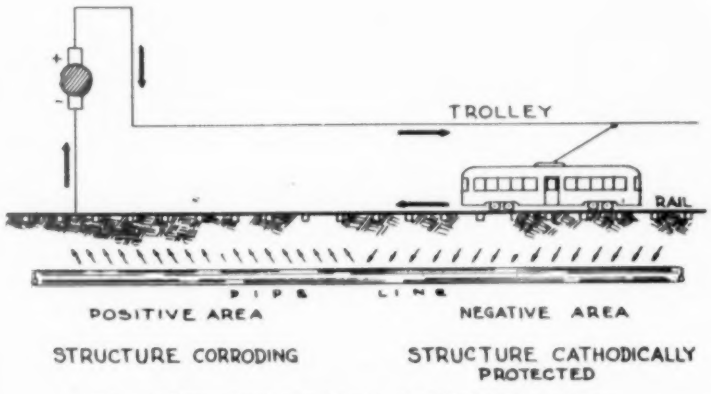

Fig. 17—Stray-current corrosion in electrified railway systems.

In the negative areas where current is flowing onto the pipe line, the pipe is the cathode of an electric cell, and conversely, where the current is flowing from the pipe to ground, the positive area, the pipe is the anode of an electric cell. Wherever these stray electric currents leave the pipe line to flow through soil to substation, the pipe area (the anode) will corrode.

Severe corosion . . . The force causing the corrosion is exactly the same kind of force as that developed by the galvanic cell, but in this case, the electric drive or electric force behind it is many times greater than the maximum forces that can possibly be developed in a galvanic cell. Not only is it possible to have these much greater driving forces, but the total amount of current available may be hundreds of amperes, compared to the fractions of an ampere developed by a galvanic cell.

It is a known fact that 1 amp. of current flowing off the surface of a pipe line for 1 year will carry with it 20 lb. of the pipe-wall metal; consequently, stray-current corrosion can be both rapid and severe.

Determination of the location of these positive and negative areas along the surface of an underground structure such as a pipe line, is accomplished by making a potential survey of the earth in the vicinity of the pipe line in the same manner as that conducted to determine the location of anodes and cathodes described in the chapter on galvanic corrosion. The only difference is that because the stray currents are highly variable quantities, whereas the galvanic currents were constant quantities, it is necessary in this case to use recording instruments to determine the potential profile of the structure in question.

When these stray currents are in the vicinity of electric street railway, it is sometimes more convenient to take the profile by measuring the potential difference between the pipe line and the rail of the street-car system.

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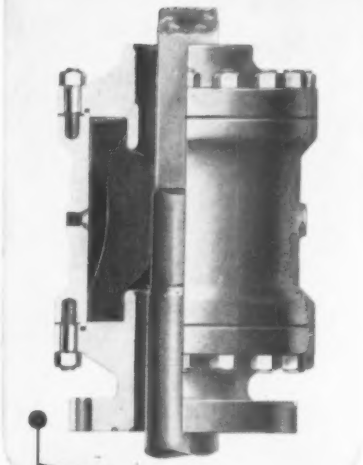

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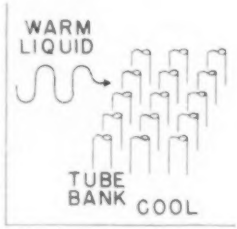
Part 34 of a series

by Dr. B. E. Lauer, Head, Department of Chemical Engineering, University of Colorado

h_f HEAT TRANSFER

COEFFICIENT of HEAT TRANSFER through FILM between OUTSIDE SURFACE of BANK of COOL TUBES and a WARM LIQUID



Tube Position: Vertical

Tube Arrangement: In line

Liq.Movement: Turbulent

Direction of Movement: Normal to tube.

EQUATION:

$$h_f = 0.26 \frac{k}{D_o}\left[\frac{D_o V_{max} \rho}{\mu}\right]^{0.6}\left[\frac{C_p \mu}{k}\right]^{0.33}$$

TERMINOLOGY:

h_f - Coefficient of heat transfer, BTU/ft.^{2} hr. $^\circ$F.

D_o - Outside diameter of tube, ft.

k - Thermal conductivity of liquid at t_f, BTU/ft. hr.$^\circ$F.

V_{max} - Maximum velocity of liquid through free space between front bank of tubes, ft./hr.

ρ - Density of liquid at t_f, lbs./ft.^{3}

μ - Absolute viscosity of liquid at t_f, lbs./hr. ft.

C_p - Specific heat of liquid at t_f, BTU/lb.$^\circ$F.

t_f - Film temperature = 1/2 sum of outer wall temperature and body temperature.

LIMITATIONS: The Reynolds number $(D_o V_{max} \rho / \mu)$ must be over 2000.

Equation above for data taken on bank of tubes 10 rows deep. For shallower tube banks $h_{f(corr)} = h_{f(calc)} \times$ correction factor as follows:

Rows	Factor	Rows	Factor	Rows	Factor	Rows	Factor
1	0.64	2	0.80	3	0.87	4	0.90
5	0.92	6	0.94	7	0.96	8	0.98
9	0.99	10	1.0				

SIMPLIFIED EQUATION:

for water

$$h_f = 296(1+0.0067 t_f)\frac{(V_{max}/3600)^{0.6}}{(12 D_o)^{0.4}}$$

SOURCES OF DATA: For physical constants for use in above equation see Chemical Engineers' Handbook - J. H. Perry (1948).

for ρ -- see pp. 130-148, 178-195, 1883.
μ -- see pp. 370-374, 1196, 1896.
k -- see pp. 460-461, 1203, 1897.
C -- see pp. 225-228, 207, 1885, 1896.

REFERENCES:

1. Heat Transmission, William H. McAdams, pp. 259-269.
2. Elements of Heat Transfer and Insulation, Jakob & Hawkins, p. 115.
3. Introduction to the Transfer of Heat & Mass, Eckert, pp. 144-145.

K 2 c (2)

COEFFICIENT of HEAT TRANSFER through FILM between OUTSIDE SURFACE of a BANK of WARM TUBES and a COOL GAS

Tube Position: Vertical

Tube Arrangement: Staggered
In line

Gas Movement: Turbulent

Direction of Movement: Normal to tubes

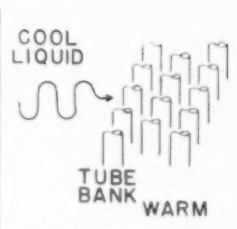
Reference should be made to equations

K 1 c (1)
K 1 c (2)

for equations applicable to heating a gas by passing it over a bank of heated vertical tubes in a direction normal to the axes of the tubes.

K 4 c

COEFFICIENT of HEAT TRANSFER through FILM between OUTSIDE SURFACE of WARM BANK of WARM TUBES and a COOL LIQUID



Tube Position: Vertical

Tube Arrangement: Staggered
In line

Liquid Movement: Turbulent

Direction of Movement: Normal to tubes

References should be made to equations

K 2 c (1)
K 2 c (2)

for equations applicable to heating a liquid by passing it over a bank of heated vertical tubes in a direction normal to the axes of the tubes in the bank.

K 5 c

IMPORTANT DATA FOR WELDING ROD PURCHASERS

WELD-O-GRAM

SUPPLIED BY A. O. SMITH FOR IMMEDIATE RELEASE

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SW-80

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HERE'S THE STORY...

Radiographic inspection of 50,000 joints was made during construction of a major transmission main.

One-fourth of the inspected welds were made with the A. O. Smith SW-80 rod. Rejections were only 1%. Rejections among the rest of the welds made with competitive rods were *more than* 2%.

In other words more than twice as many joints welded with competing rods were rejected as compared with those welded with the SW-80.

If all joints had been welded with the A. O. Smith pipe line electrode, rejects would have been cut by 500. This could conceivably yield a saving that would more than repay total expenditures for electrodes used on the entire pipe line comprising approximately 200,000 joints.

No wonder the new SW-80 electrode is gaining acceptance all along the line!

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WELDING PRODUCTS

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ELECTRIC LOGGING—2

. . . Resistivity of Liquids

by R. I. Martin*

MOST minerals and rocks are poor conductors of electricity when they are in the dry state. As they occur in nature, however, porous rocks contain connate or interstitial water which is mineralized to a greater or less extent, and is therefore a fairly good conductor of electricity. The resulting resistivity of the water-saturated rock is a function of both the rock texture and the water resistivity.

The unit of resistivity used in electric logging is the ohm-meter, sometimes shown as ohm-meters^2/meter. This is the resistance offered by a cube of material with sides 1 m. long, to the flow of a uniform current in a direction parallel to one edge of the cube. Resistivity changes with changes in temperature.

The effects of temperature on the resistivity of liquids are most easily shown, and corrections made by charts similar to that shown in Fig. 1.[1] Since the predominant chemical in most connate waters is sodium chloride it is convenient to consider the effects of these radicals alone. The chloride radical reported in the water analysis is converted to sodium chloride by multiplying by 1.65, and it is assumed that this equivalent value will represent adequately the behavior of the connate water. Errors so introduced are small unless the water is very low in sodium chloride.

In Fig. 1 the variation in resistivity of an aqueous solution of sodium chloride is shown in terms of the concentration for several selected constant temperatures. Two main points of interest are:

1. Resistivity decreases approximately in proportion to concentration. For example, a water containing 7,000 mg. per liter has a resistivity of approximately one ohm-m at 68° F. If the concentration is increased to 40,000 mg. per liter the resistivity is reduced to 0.2 ohm-m. at 68° F. Because the resistivity of rocks depends in part on the resistivity of the connate water it is apparent that changes in resistivity of the amount just described must be taken into account. Therefore a knowledge of the water salinity is highly desirable for work involving electric logs. Attention paid to securing uncontaminated water samples from known sources will pay good dividends.

2. Resistivity decreases with an increase in temperature. Using the values considered before, the water with a concentration of 7,000 mg. per liter changes in resistivity from 1 ohm-m. at 68° F. to 0.3 ohm-m. at 212° F. Because of large reductions in resistity it is obvious that the temperature correction must be taken in account when comparing the resistivities of sands containing similar waters, at different depths.

The broken line in Fig. 1 represents solutions to the equation:

$$Rw = \frac{5000}{C}$$

where Rw is the resistivity in ohm-m. and C is the concentration in milligrams per liter. This equation gives approximate values for the resistivity of the water, and is useful if charts or tables are not at hand. The error resulting from using this equation is variable and the amount may readily be determined from a study of the information shown on the graph.

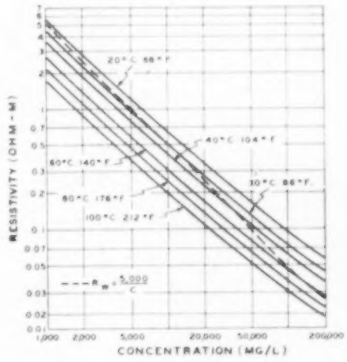


Fig. 1—Changes in resistivity with concentration and temperature.

The concentration scale used on this graph—milligrams per liter—is a very practical one. Core-analysis water salinities are calculated on this basis. Of considerable importance is the need to be sure that the values for sodium chloride are used and not just the value for the chloride radical alone, which is sometimes given in the results of analyses.

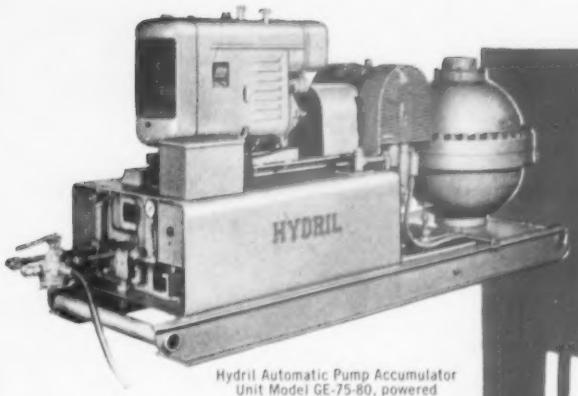
Another use of the chart is to provide a convenient method of correcting the drilling-mud resistivity from the temperature at which its resistivity is measured to the temperature prevailing at depths within the well. Although the chart is based on sodium chloride solutions, and drilling mud contains other chemicals, it is probable that no very great error arises in using the chart for this purpose. At normal mud resistivities of 2 ohm-m. the equivalent concentration of sodium chloride is less than 5,000 mg./l. and the types of curves given by other salts are not too different at low concentrations. At low mud resistivities the lower resistivity can only be a function of the high sodium chloride content of the mud, and therefore it is logical to use the charts in this range.

A second factor besides temperature which might be considered to affect resistivity is pressure. An increase in pressure will modify the viscosity, volume, and ionization. These, in turn, will result in changes in resistivity. However, as the increase in pressure with depth is accompanied by an increase in temperature, it is unlikely the increase in mud resistivity due to pressure exceeds a maximum of 5 per cent.

Reference

1. Guyod, H., "Electrical Well Logging," reprint of Oil Weekly series obtainable from Halliburton Oil Well Cementing Co., p. 73.

*Assistant professor of petroleum engineering, Missouri School of Mines and Metallurgy.



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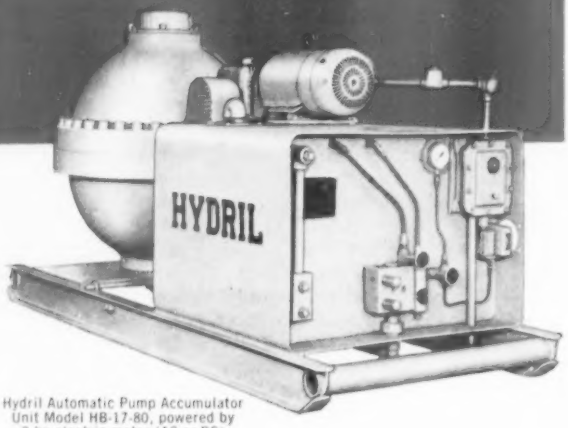

Hydril Automatic Pump Accumulator Unit Model HB-17-80, powered by 3-hp electric motor (AC or DC)

OPERATION: The Accumulator is pre-charged to 750 psi with air or nitrogen in the upper chamber. Fluid pumped into the lower chamber will compress the gas in the upper chamber from 750 psi to 1500 psi, at which point the pressure switch will stop the pump. When pressure is reduced by withdrawal of fluid from the Accumulator, it is automatically restored.

For more detailed information, refer to the Hydril section of your Composite Catalog, or contact your nearest Hydril representative.

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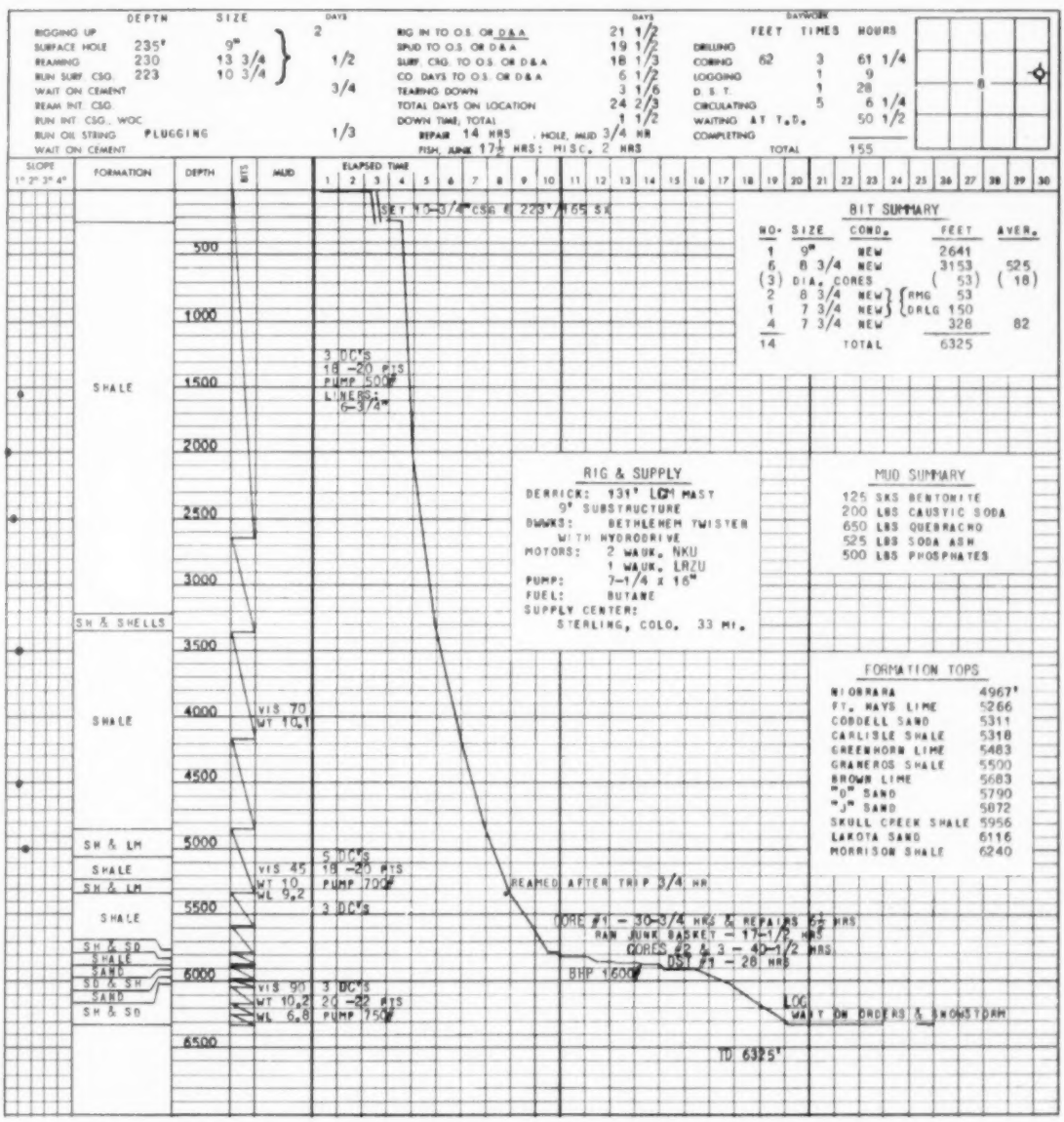

(Compiled for The Oil and Gas Journal by Drilling Data Service, Oklahoma City)

EQUIPMENT MEN . . . in the News

Hughes Tool Names Sales Organization Appointments

W. H. SIEMS

Announcement has been made by M. E. Montrose, vice president - sales, Hughes Tool Co., of the following appointments in Hughes Tool sales organization: W. H. Siems has been appointed general sales manager; F. T. Alexander has been appointed special tool joint representative; H. W. Harms has been named to newly created position

ALEXANDER

H. W. HARMS

of manager of field engineering services, and will transfer to general sales department of the company in Houston; J. R. Lesch is appointed northern

J. R. LESCH

N. B. THOMAS

regional engineer, replacing Harms; and N. B. Thomas has been named Rocky Mountain division engineer, Casper, Wyo., replacing Lesch.

Siems was assistant general sales manager for the past 3 years, having previously been in charge of export sales in New York and other sales department assignments during his 28 years of service. Alexander has assumed various assignments with Hughes Tool since 1935, having served in the capacity of tool joint requirement supervisor for the past several years.

Since 1935 Harms has held various field engineering positions in various oil-producing sections of the United States for Hughes Tool, and has served as Northern regional engineer, with headquarters in Oklahoma City, since January 1949. Lesch has been associated with Hughes Tool since 1946 in various field-engineering assignments, his previous position being Rocky Mountain division engineer in Casper. Thomas has been with the company since 1948, serving on field engineering assignments in both Oklahoma-Kansas and Rocky Mountain divisions, as well as receiving special engineering training in the Houston main plant. Prior to his new appointment he was Casper district engineer.

Rockwell Shifts Instrument Production to Tulsa

Rockwell Manufacturing Co. is transferring all of its gas-industry instrument production from Pittsburgh to its Macnick division plant in Tulsa, as announced by L. A. Dixon, Jr., vice president of the firm's meter and valve division.

According to Dixon, when the move is completed all Rockwell combined record gages, Emcorrectors, flow-line provers, and flow-line indicator meters will be turned out at the Tulsa plant. Employes previously engaged in production of this equipment in Pittsburgh will be absorbed by the recent transfer of the register and air-hydraudraulic drill unit divisions to Pittsburgh. Dixon also stated the chief reason for the Tulsa move was to concentrate instrument production in one locality for better engineering and manufacturing control.

General manager of the Macnick division is W. M. Connor.

Gardner-Denver Announces Personnel Promotions

G. V. Leece, vice president and general sales manager of Gardner-Denver Co., Quincy, Ill., has recently announced promotions and new titles for personnel in the Gardner-Denver sales department. C. M. George has been named sales administrator; O. C. Knapheide, Jr., sales manager of the oil-field and industrial division; and C. H. Rieman, sales manager of the mining and contracting division. In addition, J. R. Affre has been named sales supervisor of the oil-field and industrial division; E. A. Linneman is sales supervisor of the contracting division, and J. A. Caverly is sales supervisor of the mining division.

Bradford Supply Co. to Represent S. C. Carter

S. C. Carter Co., Inc., Los Angeles manufacturers of Carter long-stroke hydraulic pumping unit, has announced the appointment of Bradford Supply Co. as distributors for Illinois, Indiana, and Kentucky.

Bradford will handle sales and service of the Carter units from its branches at Irvine, Ky., Oil Springs, Ky., Owensboro, Ky., Princeton, Ky., Robinson, Ill., and Salem, Ill.

Hamer Oil Tool Licenses Joshua Hindle & Sons, Ltd.

Joshua Hindle & Sons, Ltd., Leeds, England, have been licensed by Hamer Oil Tool Co., of Long Beach, to manufacture and market Hamer line blind valves in England and other sterling areas.

Leland S. Hamer, president of the company, in making the appointment public, pointed out that licensing of Hindle & Sons is another step in Hamer Co.'s long-range selling expansion program designed to meet growing demand of foreign industries for Hamer line blind valves.

W. Gomersall, managing director for Hindle Co., upon signing the contract, stated that Hindle & Sons will market the line blind valves under the name of Hindle-Hamer.

Leland S. Hamer (left), president of Hamer Oil Tool Co., Long Beach, Calif., and W. Gomersall, managing director, Joshua Hindle & Sons, Ltd., Leeds, England.

Formation of Detachable Ditcher Firm Announced

A. G. BURNS

Formation of a new manufacturing concern, Unimatic Corp., has been announced by Alvin G. Burns, formerly in charge of ditcher - manufacturing division of Unit Rig & Equipment Co., Tulsa.

Unimatic, a Delaware concern, will manufacture a detachable ditching machine for use on

K. W. DAVIS

COURTNEY

Caterpillar crawler tractors. Headquarters office and manufacturing will be located in Tulsa. The new machines

F. C. MORTON

H. J. McAULAY

will be sold through distributors for Caterpillar Tractor Co.

Officers of Unimatic Corp. are: Alvin G. Burns, president; Paul Courtney, vice president; F. C. Morton, treasurer, and Warren Scarborough, secretary. Directors are K. W. Davis, president of Mid-Continent Supply Co., Fort Worth; Burns, and Scarborough. Hubert J. McAulay, former project engineer for Unit Rig, is chief engineer with Unimatic.

Burns had been in charge of ditcher manufacturing for Unit Rig for the past 3 years. Courtney is president of Unit Rig and Scarborough is a member of a Fort Worth law firm and is associated with other industrial firms. Capacities of the ditchers to be manufactured by the new firm will range from 12-in. ditches 5 ft. deep, to 52-in. ditches 8½ ft. deep. First showing of the equipment was a pilot model displayed at the Caterpillar Tractor Co. exhibit at the International Petroleum Exposition. Actual production models will be like the pilot model from an engineering standpoint but will have design differences.

An important feature of the detachable ditcher will be the Unimatic drive, which will be placed on the tractor to deliver speeds below the normal range of the tractor. This attachment will make it possible to slow the speed of the combined equipment to as low as 4 in. a minute.

G.S.I. Holds Third Annual Supervisory Conference in Dallas

Studies in ways to improve management proficiency and discussion of new developments in Geophysical Service, Inc.'s, methods of geophysical exploration were topics for the third annual G.S.I. supervisory conference held in early May at the company's plant in Dallas. G.S.I. management personnel attending were, standing: B. A. Harris, supervisor, McAllen, Tex.; Roy Fuller, correspondence training director, Dallas; Paul Swenson, supervisor, Bakersfield, Calif.; Earl Thomas, supervisor, Austin, Tex.; Ray Wright, supervisor, Houston; R. D. Everett, personnel director, Dallas; M. E. Trostle, party chief, Rankin, Tex.; Chris Elston, supervisor, Houma, La.; E. A. Kiesler, supervisor, Calgary, Alta.; J. L. Stephens, supervisor, Peace River, Alta.; J. V. McManus, chief field service engineer, Dallas; Clark E. Allen, supervisor, New Orleans; Gordon Cloepfil, supervisor, Billings, Mont.; J. W. Gary, manager of equipment, Dallas; V. W. Teufel, supervisor, Shreveport; T. A. Halbrook, supervisor, Calgary; C. M. Moore, Jr., vice president of Geophysical Service International Corp., Calgary; R. H. Rainey, supervisor, Calgary; J. M. Proffitt, supervisor, Houma, La., and E. A. Vetter, controller, Dallas.

Seated: G. J. Kohler, Jr., division manager, Mexico, D. F.; D. W. Rockwell, supervisor, Mexico, D. F.; K. E. Burg, vice president, technical, G.S.I., Dallas; Robert Dyk, division manager, Denver; F. J. Agnich, executive vice president of G.S.I., Dallas; F. E. Romberg, division manager, Houston; T. P. Ellsworth, division manager, Bakersfield, Calif., and E. J. Stulken, chief seismologist, Dallas.

Tube-Kote, Inc., Appoints Garner Sales Manager

C. L. GARNER

C. L. Garner has been named sales manager of Tube-Kote, Inc., Houston, applicators and manufacturers of corrosion - resistant linings for tubular equipment. The announcement was made by L. E. Heinen, president.

Garner has been with Tube - Kote since 1948. He began as a sales engineer covering Louisiana, Mississippi, and Arkansas. Garner's new post includes supervision of sales of Tube-Kote's services, dealing primarily with oil and chemical firms.

Southern Engine & Pump Appointed by Nordberg

Appointment of Southern Engine & Pump Co. as distributor for Nordberg 4FS diesel engines in 117 Texas counties and southern Louisiana has been announced by Nordberg Manufacturing Co., Milwaukee.

Nordberg 4FS diesel engines will be sold and serviced through Southern Engine branches located at Dallas, Edinburg, Kilgore, and San Antonio, Tex., and New Orleans, La. Nordberg 4FS diesel engines are added to its present lines which include Le Roi engines, and Pomona, Goulds, and Viking pumps.

Southern Engine was organized in 1908 with one office and a crew of four. This organization now has branches in six Texas and Louisiana cities, and executive offices and manufacturing facilities at Houston. The company plans to supplement its sales representation by building another branch office with warehouse and shops in New Orleans.

Founder of Southern Engine was C. A. Leavens, who is still active as chairman. D. N. Wommach is president, and W. G. Price is vice president in charge of sales. S. R. Carrington, secretary, is in charge of sales in Louisiana. Richard Kropp is vice president and chief engineer, a veteran of 30 years with Southern Engine.

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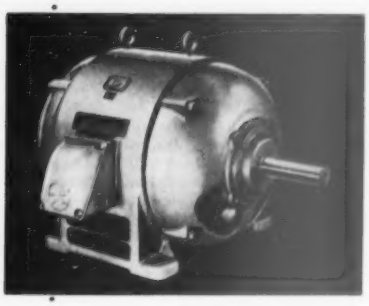

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Pipe-Line Construction

PIPE-LINE activity as reported below by The Oil and Gas Journal is compiled from information received from pipe-line companies and contracting firms.

These projects include those planned, proposed, under way, and contracted. Uncontracted projects are indicated by a • preceding the company name.

Crude-Oil Pipe Lines

• **California - Oregon Pipe Line System**—103 miles, 6-in., proposed, Crescent City, Calif., to Medford, Oregon.

• **R. A. Goodall.**—45 miles, 6-in., planned, Little Beaver to Merino, Colo. (To connect with Sterling system).

• **Gulf Refining Co.**—55 miles, 12-in., planned, Bay Marchand to Plaquemines, La.

Humble Pipe Line Co.—71 miles, 16-18-in., under way, East Texas to Louisiana-Texas border. (30 miles of 16-in., and 41 miles of 18-in.) O. R. Burden Const. Co. Completion date 10-53.

Start 7-1, Longview to Louisiana border.

• **Interstate Oil Pipe Line Co.**—116 miles, 22-in., planned, Shreveport to Baton Rouge, La.

Interstate Oil Pipe Line Co.—55 miles, 16-in., under way, Raceland to Anchorage, La.

Under way, Raceland to Plaquemine, La. L. E. Farley, Inc. 6-15-53.

Plaquemine to Anchorage, La.

22 miles, 18-in., contracted, Louisiana-Texas state line to near Shreveport, La. River Const. Corp. 6-53.

28 miles, 22-in., contracted, Shreveport, La., to Coushatta, La. River Const. Corp. 6-53.

Lakehead Pipe Line Co.—635 miles, 30-in., under way, Superior, Wis., to Sarnia, Ontario, Canada.

Contracted, Superior to Wisconsin-Michigan state line. Mahoney Contr.

Mackinac City along Straits of Mackinac to Red Oak, Mich. Bechtel Corp.

Red Oak via Bay City to International Boundary south of Port Huron on St. Clair River. Conyes Const.

Water crossings of Mackinac, Saginaw, and St. Clair rivers. Merritt - Chapman & Scott Corp., W. J. Meagher & Sons, Inc., and Midwestern Constructors.

Under way, Michigan-Wisconsin State line through Crystal Falls to Cooks, Mich. Anderson Bros. 9-15-53.

Under way, Cooks to St. Ignace, Mich., on Straits of Mackinac. Midwestern Constructors, Inc.

• **Magnolia Pipe Line Co.**—29 miles, 8-in., planned, Midland County, Texas area.

• **Pasotex Pipe Line Co.**—146 miles, 10-in., planned, Snyder to Wink, Tex.

Phillips Pipe Line Co.—45 miles, 12-in., under way. Rancho system to Sweeny, Tex. Morrison Constructors. 6-53.

26 miles, 8-in., under way, northeast area of Andrews County, Texas.

18 miles, under way, gathering lines, northeast area of Andrews County, Texas.

Platte Pipe Line Co.—93 miles, 12-14-in., under way. Chatham station near Worland, Wyo., to Oregon basin, and Byron field. R. H. Fulton Co. Completion date 6-53.

Under way Chatham, Wyo., to Oregon basin. R. H. Fulton Co.

Under way Oregon basin to Byron-Garland field. R. H. Fulton Co.

• **Progress Pacific Pipeline Co.**—1,100 miles, 24-in., planned, Odessa, Tex., to Los Angeles Harbor, Calif.

• **Roosevelt Oil & Refining Corp.**—22 miles, 4 and 6-in., planned St. Helens to Norwich, Mich.

Service Pipe Line Co.—153 miles, 12-16-in., proposed, Tioga-Beaver Lodge area to Mandan, N. D. O. R. Burden Const. Co.

55 miles, 4-6-8-in., contracted, Tioga-Beaver Lodge area gathering system. C. P. Bartley & Son.

Texas Pipe Line Co.—34 miles, 6-in., under way, Sour Lake to Port Arthur, Tex. Houston Contracting.

45 miles, 8-10-in., under way, between Erath and Bayou Sale stations. Houston Contracting Co.

• **West Coast Pipeline Co.**—960 miles, 20-22-in., planned, Wink, Tex., to Norwalk, Calif.

Products Pipe Lines

H. W. Bass & Sons., Inc.—152 miles, 4-6-in., proposed, Duval and Live Oak counties, Texas, to Corpus Christi, Tex.

Buckeye Pipe Line Co.—370 miles, 10-14-16-in., under way, Linden, N. J., via Allentown, Pa., to Auburn, Syracuse, Waterloo, and Rochester, N. Y. 9-53.

Guthsville to Dupont, Pa. Pipe Line Const. & Drilling Co.

Dupont north to Pennsylvania-New York state line. Fulghum Contr. Corp.

Pennsylvania-New York state line to Auburn, N. Y. Williams-Austin.

Auburn to Syracuse, N. Y. Williams-Austin.

Auburn to Caledonia, N. Y. Universal Map and Survey Co.

• **Continental Pipe Line Co.**—(Yellowstone Line)—600 miles, 8-in., planned, Billings, Mont., to Spokane, Wash. (Joint ownership of Sinclair Pipe Line Co., Gulf Refining Co., and Texas Pipe Line Co.)

Harbor Products Systems—36 miles, 16-in., under way. Woodbury Junction, Philadelphia to Trembley Point, N. J. Construction Service Co. and H. C. Price Co.

Indiana Farm Bureau Cooperative Association, Inc.—180 miles, 8-in., under way, Mt. Vernon to Indianapolis, Ind. R. B. Potashnick, contractor.

70 miles, 4-in., under way, Indianapolis to Peru, Ind. R. B. Potashnick, contractor.

Inland Empire Pipe Line Co.—504 miles, 10-in., proposed, Billings, Mont., to Spokane, Wash.

• **Kaneb Pipe Line Co.**—236 miles, 8-in., planned, Wichita and Potwin, Kans., to Fairmont, Neb. 9-53.

• **Phillips Petroleum Co.**—54 miles, 6-in., planned, Goldsmith to Borger, Tex.

52 miles, 10--in., planned, Shell's Brookshire system to Sweeny, Tex.

Phillips Pipe Line Co.—33 miles, 12-in., Texas and Oklahoma loops. R. H. Fulton & Co. 6-53.

30 miles, 12-in., Kansas loops. 6-53.

Plantation Pipe Line Co.—82 miles, 14-in., contracted, Charlotte to Greensboro, N. C. Anderson Bros.

Salt Lake Pipe Line Co.—140 miles, 8-in., under way, Pasco to Spokane, Wash. Lyles & Young Co. Completion date 10-1-53.

• **Standard Oil Co. (Ind.)**—Planned, Mandan, N. D., to Moorhead, Minn.

Standard Oil Co. (Ind.)—243 miles, 10-12-in., under way, Whiting, Ind., to River Rouge, Mich.

Porter, Ind., to Colon, Mich. Somerville Const. 9-1-53.

• **Sunray Oil Corp.**—440 miles, 10-in., planned, Duncan, Okla., to Mississippi River.

Sun Pipe Line Co.—50 miles, 8-in., under way, Toledo, Ohio to Inkster Junction west

of Detroit. 10-53. R. L. Coolsaet Const. Co. and Poston Pipe Line Co.

Texas Pipe Line Co. (Evangeline Products Systems)—196 miles, 16-in., under way, Port Arthur, Tex., to Baton Rouge, La. Panama-Williams Co. Completion date 7-53.

• **United States Pipe Line Co.**—1,799 miles, 22-26-in., proposed, Beaumont, Tex., to Newark, N. J.

Beaumont, Tex., to Memphis, Tenn.
Memphis, Tenn., to Louisville, Ky.
Louisville, Ky., to Newark, N. J.
Laterals to Paducah and Lexington, Ky.

• **Williston Basin Pipe Line Co.**—244 miles, 8-in., proposed, Laurel-Billings, Mont., refineries to Glendive, Mont.

• **Wolverine Pipe Line System**—200 miles, 14-in., planned, Chicago to Toledo and Detroit. (Joint ownership of Shell, Texas, and Cities Service). Completion date 1-54.

Natural-Gas Pipe Lines

• **Allied Gas Co.**—24 miles, 6⅝-in., proposed, McLean to Champaign County, Illinois.

• **Arkansas-Missouri Power Co.**—140 miles, 2 to 10-in., planned, St. Francis River, Clay County, Arkansas, to near Campbell, Mo.

• **Associated Natural Gas Co.**—88 miles, Missouri.

• **Atlantic Seaboard Corp.**—29 miles, 26-in., proposed, looping along Cobb-Rockville line.

• **Carolina Natural Gas Corp.**—185 miles, 2-12-in., proposed, lateral lines off Transcontinental in North and South Carolina.

• **Chattahoochee Natural Gas Co.**—70 miles, proposed, Floyd County, Georgia, to Dalton, Ga.

• **Chicago District Pipe Line Co.**—35 miles, 24-30-in., proposed, Chicago area.

• **Cities Service Gas Co.**—18 miles, 16-in., Lawrence and Newton counties, Missouri.

69 miles, 20-16-in., proposed, Cleveland, McClain, and Garvin counties, Oklahoma.

• **Coast Counties Gas & Electric Co.**—40 miles, 3, 4, and 8-in., planned. Coast and Valley region, California.

• **Colorado Interstate Gas Co.**—365 miles, 22-in. proposed, Green River, Wyo., to Denver, Colo. 1954.

116 miles, proposed, Colorado, Oklahoma, Texas, and Kansas. 1953.

• **Cumberland and Allegheny Gas Co.**—31 miles, 12-in., proposed, Garrett County, Md., to Keyser, W. Va.

• **East Tennessee Natural Gas Co.**—158 miles, 16-in., start July, Knoxville to Kingsport, Tenn. (58 miles of laterals.) 11-53.

• **El Paso Natural Gas Co.**—1,778 miles, proposed, Permian basin, New Mexico, Texas and Colorado.

• **Fort Worth Basin Gas Co.**—Planned, Novice, through Brown and Comanche counties, Texas.

• **Glacier Gas Co.**—285 miles, 20-in., proposed, Kalispell, Mont., to Spokane, Wash.

120 miles, 16-in., proposed, Spokane to Hanford, Wash.

91 miles, 8⅝-in., proposed, Spokane to Lewiston, Idaho.

130 miles, 12¾-in., proposed, Spokane to International boundary at Trail, British Columbia.

Gulf Interstate Gas Co.—860 miles, 30-in., under way. Acadia Parish, La., to Boyd County, Ky. H. C. Price and Houston Contracting. 11-54.

Under way (north section) Kincade, Tenn., to Kenova, W. Va. H. C. Price.

(Southern section) Lake Charles, La., to Kincade, Tenn. Houston Constr.

230 miles, gathering lines, contracted, Associated Pipe Line Contractors, Anderson Bros., Williams Bros.

329 miles, 12 to 24-in., proposed. Laterals

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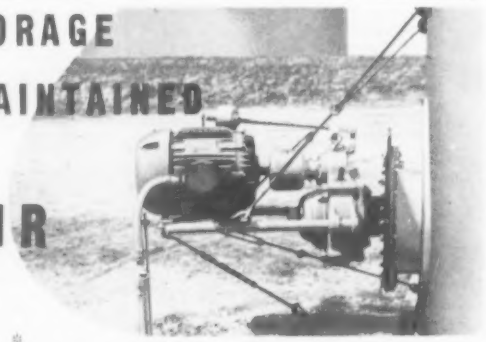

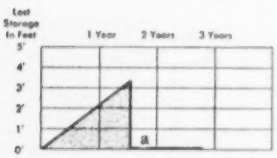

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These records show that sediment had accumulated, in some cases, at a rate of over 2 ft. per year. Tanks were cleaned and SHORTSTIR Mixers installed. Thiefing after one year revealed less than 1" sediment.

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off Acadia Parish, Louisiana, to Boyd County, Kentucky, line.

• **Home Gas Co.**—32 miles, 12-in., planned, Breesport to Union Center, N. Y.

17 miles, 12-in., proposed, loops from Hansock to Sanford, N. M.

46 miles, 12-in., under way, Tioga and Broome counties, New York. H. L. Gentry Const.

22 miles, 12-16-in., under way, Binghampton, N. Y.

• **Interstate Power Co.**—26 miles, 8-in., proposed, from Nat. Gas P. L. Co. America line near Hooppole, Ill., to Clinton, Ia.

Iowa-Illinois Gas & Electric Co.—41 miles, 10-in., start last half '53, Washington County to Cedar Rapids, Iowa.

Kansas-Nebraska Natural Gas Co., Inc.—54 miles, 4-6-in., under way, Neligh to Hartington, Neb. Brodie Constr. 9-53.

42 miles, 4-6-in., under way, Neligh to O'Neil, Neb. Brodie Const. 9-53.

61 miles, 3-2-in., under way, lateral lines from Broomfield through various towns to Wausa, Neb. Brodie Const. Co. 9-53.

• **Lone Star Gas Co.**—100 miles, proposed, storage fields to the Dallas-Fort Worth area.

35 miles, 12-in., proposed, southeastern Schleicher County.

• **Manufacturers Gas Light & Heat Co.**—40 miles, proposed, Allegheny, Washington, and Beaver counties, Pennsylvania.

213 miles, 3 to 26-in., proposed, various points on system in Pennsylvania, West Virginia, and Ohio.

Michigan Gas Storage Co.—30 miles 26-in., under way, Lainsburg Junction north. Mahoney Contracting. 7-1-53

• **Mississippi River Fuel Corp.**—109 miles, 10-18-in., planned, laterals in Woodlawn and Waskom gas fields, Texas.

Missouri Central Gas Co.—25 miles, 6-in., contracted, Moberly to Macon, Mo. L. R. Young Const. Co.

• **Missouri Public Service Co.**—136 miles, 8-10-in., proposed, New Franklin to Trenton, Mo.

24 miles, 10-in., Johnson County to Clinton, Mo.

• **Montana Power Co.**—52 miles, 16-in., planned, Canada - Montana border to Cut Bank, Mont.

• **Morganfield Natural Gas Co.**—31 miles, 4-6-in., planned, through Sturgis, Providence, Clay, Diamond, Wheatcroft, and Sullivan, Ky.

• **Natural Gas Producers Inc.**—100 miles, 12-in., planned, Yenter pool to Denver, Colo.

• **Nevada Natural Gas Pipe Line Co.**—114 miles, 12¾-in., proposed, Topock, Ariz., to Las Vegas, Nev.

• **New River Gas Co.**—50 miles, planned, Summers to Monroe counties, West Virginia, to Narrows and Dublin, W. Va.

• **New York State Electric and Gas Co.**—59 miles, 8-10-24-in., proposed, Oneonta and Norwich to DeRuyter, N. Y.

New York State Natural Gas Corp.—104 miles, 14, 16, 20-in., under way, looping on Westmoreland, Armstrong, and Tioga counties, Pennsylvania. (Includes 17 miles, 16-in., in Potter County, Pennsylvania, and 21 miles 14-in., replacement in Line No. 507, New York.)

Colesburg Junction to Sabinsville, Pa. (begin at completion of Angelica job), Williams-Austin. Howard Bauer, superintendent.

21 miles, Columbiana and Stark counties, Ohio.

• **New York State Natural Gas Co.**—75 miles, 20-in., proposed, Cameron County to Armstrong County, Pennsylvania.

58 miles, 14 and 20-in., planned, New York State line.

Sabinsville to Boom station.

Skaneateles to Onondaga, N. Y.

Ithaca to Dryden, N. Y.

Niagara Mohawk Power Corp.—55 miles, 10-in., under way. Watertown to Syracuse, New York. Williams-Austin Co. 8-1-53.

• **Northern Indiana Fuel & Light Co.**—33 miles, 8-in., proposed, Edgerton to Auburn, Ind.

• **Northern Natural Gas Co.**—580 miles, proposed, Kansas, Texas, Oklahoma, and Nebraska loops.

Northern Natural Gas Co.—Section No. 1, 92 miles, 30-in., under way, Dumas via Sunray to main line north of Canadian River, Texas, and two loops near Beaver station, Oklahoma. R. H. Fulton & Co.

Northern Natural Gas Co.—Section 2, 70 miles, 30-in., contracted, loops near Mullinville, Bushton and Clifton stations, Kans., and Palmyra station, Neb. Lone Star Constructors.

Northern Natural Gas Co.—Section 3, 94 miles, 24-in. and 30-in., contracted loops near Paulina, Ogden, and Oakland stations, Iowa. G. G. Griffis Construction Co.

Northern Natural Gas Co.—140 miles, 4-6-8-in., under way, south of Rolla, Kans., to Guymon, Okla. Reese Bros. Const. Co.

• **Northwest Natural Gas Co.**—750 miles, planned, Washington, Oregon, and Idaho.

24-in., Eastport, Idaho, to Monroe, Wash.

18-in., Monroe to International boundary near Lynden, Wash.

22-in., Monroe to near Seattle, Wash.

20-in., Seattle to Portland, Ore.

• **Ohio Fuel Gas Co.**—31 miles, 20-in., planned, Licking County to Richland County, Ohio.

22 miles, 16-in., planned, Dayton, Troy, Piqua, and Sidney, Ohio.

23 miles, 16-20-in., planned, Wellington to Elyria, Ohio; 16 miles, 20-in., planned, Benton Station to Crawford Station; 18 miles, 20-in., Crawford Station to near Columbus; 16 miles, 16-in., planned, Berlin to Sandusky, Ohio.

74 miles, 3 to 20-in., planned, Hocking, Knox, and Ashland counties, Ohio.

47 miles, 20-in., planned, Benton Township, Hocking County, to Columbus, Ohio.

61 miles, planned, northern and southwestern Ohio.

33 miles, 20-in., proposed, Jefferson to Seneca, Ohio.

Oklahoma Natural Gas Co.—50 miles, 18-in., under way, Sapulpa to Chouteau, Okla. Engineering Const. Co. 6-53.

Pacific Gas & Electric Co.—50 miles, 12-16-20-in., planned, Fresno to Merced, Calif.

(Section 2) 20-in., Holm to Topock-Milpitas line.

(Section 3) 12-in., parallel existing Madera-Livingston line, planned. Napa Wye to Shellville; Cotati to Santa Rosa, Calif.

170 miles, 34-in., proposed, main-line loops along Topock, Ariz., to Milpitas, Calif.

Pacific Gas & Electric Co.—86 miles, 34-in., under way, parallel sections along Topock-Milpitas line. Engineers Pipe Line, Ltd. Summer 1953.

• **Pacific Northwest Pipeline Corp.**—1,466 miles, proposed, Ignacio, Colo., to Bellingham, Wash.

380 miles, proposed, laterals and spurs off main line to Pocatello, Idaho, to Yakima, Wash.

• **Permian Basin Pipeline Co. (Northern Natural)**—280 miles, 16-24-26-30-in., under way, West Texas and New Mexico. R. H. Fulton & Co.

Phillips Petroleum Co.—125 miles, 2 to 24-in., under way, Midland, Upton, Glasscock, and Reagan counties, Texas. Vaughn & Taylor Const. Co. Completion date 6-53.

28 miles 10-in., under way, Bayou Plant to Adams Terminal. Massey Const. Co. Completion date 7-53.

• **Public Service Co. of Colorado**—95 miles, proposed, Douglas Creek and other gas fields to Grand Junction, Colo., area.

• **Rockland Light & Power Co.**—22 miles, 8-in., proposed, Orangetown to Tompkins Cove, N. Y.

• **Shenandoah Gas Co.**—39 miles, 3-4-8-in., proposed, Middleton, Va., to Martinsburg, W. Va.

• **South Carolina Natural Gas Co.**—160 miles, 16-12-10-in., proposed, Aiken, S. C., to cities of Columbia, Summerville, and Charleston, S. C.

• **South Georgia Natural Gas Co.**—339 miles, 2-12-in., planned, Phoenix, Ala., to Tallahassee, Fla. (a) 12-in., Phoenix, Ala., to Albany, Ga., (b) 10-in., Albany, Ga., to Moultrie, Ga., (c) 8-in., Moultrie, Ga., to Tallahassee.

• **Southern California Gas Co., and Southern Counties Gas Co.**—73 miles, 30-in., planned, loops on main line from Blythe to Los Angeles.

Southern Natural Gas Co.—1,235 miles, 24 to 4½-in., under way, Louisiana, Mississippi, Alabama, and Georgia, and South Carolina. Houston Contracting and H. C. Price. Fall 1953.

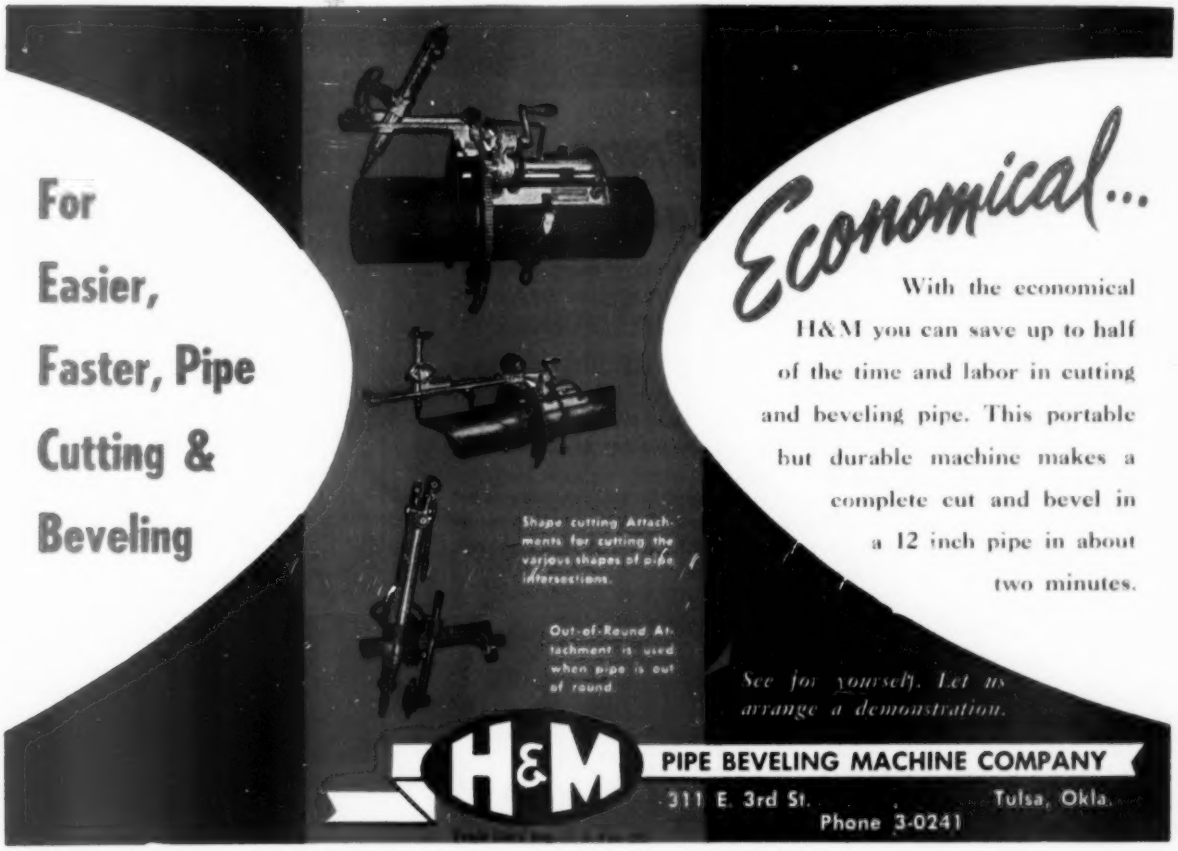
Gwinville, Miss., to Franklinton Junction, La. Houston Contr. 7-53.

Lateral from Franklinton Junction, La., to Sand Hook field, Mississippi. Houston Contracting.

Franklinton Junction, La., to Duck Lake gas field, Louisiana. Houston Contracting.

Duck Lake gas field, Louisiana, to Lake Sand field, Louisiana. Houston Contr.

• **Southwest Gas Corp., Ltd.**—26 miles, proposed, from P.G.& E. line to Victorville, Calif.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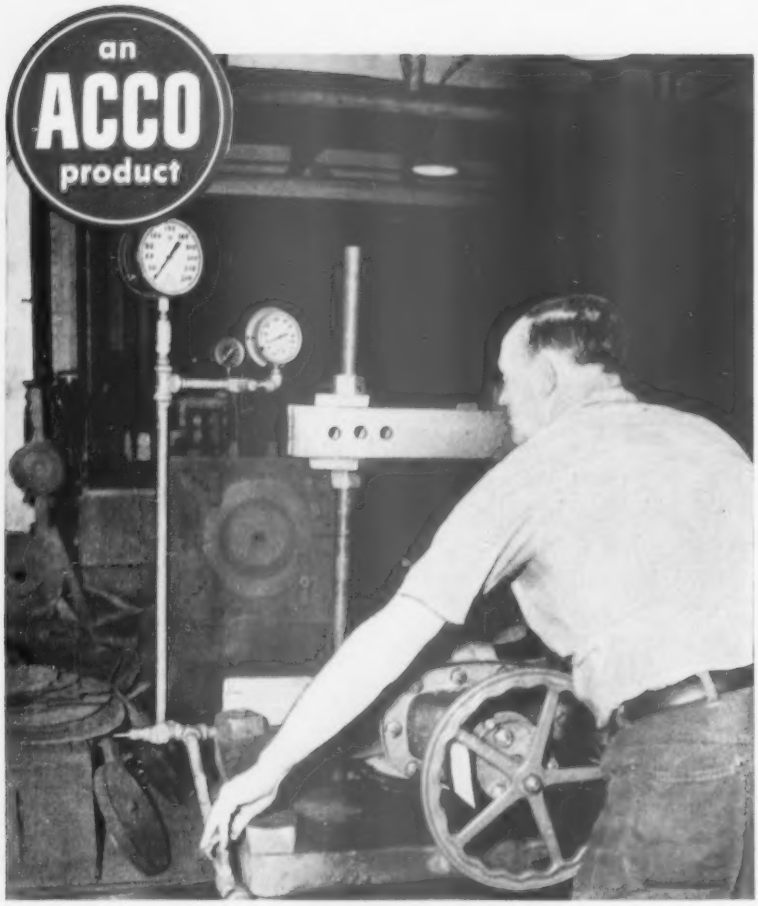

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● **Tennessee Gas Transmission Co.**—574 miles, 30-in., proposed, Kinder, La., northeast through Louisiana, Mississippi, to Portland, Tenn.

130 miles, proposed, looping in Texas and Louisiana. Including 67 miles of 30-in. line.

63 miles, 26-in., proposed, loop near Greenup, Ky., and Mercer, Pa.

45 miles, 20-in., proposed, Buffalo, N. Y., to the U. S.-Canadian border Hamburg station near St. Catherines.

Tennessee Gas Transmission Co.—Start June 1, 20 miles, 30-in., Natchitoches, La., to Goldonna, La. Oklahoma Contracting Co.

18 miles, 30-in., under way Middletown to Selmer, Tenn. Oklahoma Contracting Co.

47 miles, under way, Springfield, Tenn., to near Bowling Green, Ky. Anderson Bros. 6-15-53.

35 miles, contracted, Campbellsville, Ky., to Danville, Ky. Western Pipe Line Constructors.

21 miles, 26-in., under way, Carter, Ky., to Ohio River. Western Pipe Line Constructors.

70 miles, 24-in., under way, Mercer, Pa., to Pigeon, near Coudersport, Pa. H. C. Price Co.

60 miles, 24-in., under way, Pigeon, Pa., to Hebron field, Porter County, Pennsylvania. Bechtel Corp.

Texas Eastern Transmission Corp.—315 miles, 24-in., under way, Provident City, Tex., to Castor, La. Brown & Root, Inc. 6-20-53.

Constracted, Lavaca County to Waller County, Texas. Associated Pipe Line Contractors, Inc.

Contracted, Polk County to Shelby County, Texas. Williams Brothers Co.

Contracted, River crossings of Trinity, Brazos, Colorado, and Saline rivers. Pentzien, Inc.

● **Texas-Ohio Gas Co.**—1,435 miles, 30-in., proposed, Hidalgo County, Texas, through Arkansas, Mississippi, Tennessee, and Kentucky on to Spencer, W. Va. Completion date 6-30-53.

● **Trans-Northwest Gas, Inc.**—246 miles, proposed, International Boundary near Osoyoos, B. C., to Washington and Idaho.

275 miles, branch lines.

● **United Fuel Gas Co.**—50 miles, 20-24-in., proposed, Wood County to Lanham, W. Va. Spring 1954.

32 miles, 24-in., proposed, near Ripley, W. Va., to Lanham station, Putnam County, W. Va.

● **United Gas Pipe Line Co.**—44 miles, 20-in., planned, Lirette field to Harvey, La.

● **United Natural Gas Co.**—50 miles, 12-in., planned, Elk County to Jefferson County, Pennsylvania.

● **Utah Natural Gas Co.**—103 miles, 16-18-in., proposed, Clear Creek field near Price to Salt Lake City, Utah.

18-in., Clear Creek to Provo, Utah.

16-in., Provo to Salt Lake City, Utah.

Virginia Natural Gas Co.—153 miles, Buckingham to Richmond and Portsmouth, Va.

Warren Petroleum Corp.—78 miles, 2-24-in., proposed, Lovington, N. M. Completion date 9-53.

Westcoast Transmission Co., Ltd.—(See foreign natural gas pipe lines).

● **Western Slope Gas Co.**—34 miles, 8-in., start June, Garmesa to West Douglas Creek, Colo. 8-53.

Foreign Crude-Oil Pipe Lines

Basrah Petroleum Co.—65 miles, 24-in., under way, Zubair to Fao, Iraq. Completion date 10-53.

● **Cia. de Petroleo Ganso Azul, Ltd.**—48 miles, 4-in., planned, Ganzo Azul field to Pucalpa on upper Ucayali River, Peru.

● **Creole Petroleum Corp.**—25 miles, 34-

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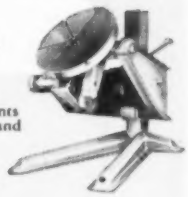

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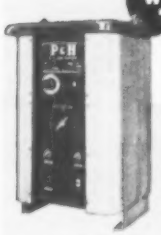

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in., planned, Lagunillas to La Salina (State of Zulia, Venezuela.)

Direccion General de Yacimientos Petroliferos Fiscales—409 miles, under way, Plaza Huincul to Bahia Blanca, Argentina.

• **Gaz de France**, 200 miles, 12-in. Ruhr to Paris, France.

Interprovincial Pipe Line Co.—135 miles, 24-in., under way, looping from Regina to U. S. border, Canada. Anderson International Contrs., Ltd. 8-53.

• **National Iranian Oil Co.**—38 miles, 12-in., planned, Lali to Masjid-i-Sulaiman, Iran.

27 miles, 12-in., planned, Kut-Abdullah to Zergan, Iran.

• **Petroleos Mexicanos.**—145 miles, 12-in., considered, 18 de Marzo field via Reynosa to Monterrey, Mexico.

100 miles, planned, Isthmus of Tehuantepec, Jose Colomo to El Plan field, Minatitlan.

72 miles, 12-in., proposed, Poza Rica to Atzacapotzalco, Mexico.

Petroleos Mexicanos.—125 miles, 10-in., under way, Jose Colomo to El Plan, Mexico.

• **Saskatoon Pipe Line, Ltd.**—56 miles, 6-in., planned, Milden to Saskatoon, Sask.

Texas Petroleum Co.—60 miles, 4-6-in., under way, Pta. Nino to La Dorada.

• **Trans Mountain Oil Pipe Line Co.**—30 miles, planned, Vancouver, B. C., terminal to Ferndale, Wash.

Trans Mountain Oil Pipeline Co.—711 miles, 24-in., under way, Edmonton, Alta., to Vancouver, B. C. Canadian Bechtel, Ltd., engineers. Completion date 8-53.

Edmonton to Acheson, Canadian Pipe Line Const. 8-53.

Jasper to Blue River, B. C., Comstock Midwestern. 8-53.

Blue River, B. C., to Coquehalla, B. C., Mannix, Ltd. 8-53.

Chilliwack to Coquehalla, B. C. Comstock Midwestern. 8-53.

Sumas to Vancouver, B. C., Comstock Midwestern 9-53.

• **Yacimientos Petroliferos Fiscales Bolivianos.**—170 miles, 4-in., planned, Bermejo to Tupiza, Bolivia.

Foreign Products Pipe Lines

Colombian Ministry of Petroleum. — 115 miles, 4-in., begin 1953, La Dorada to Cartago, Colombia, Williams Bros. Engineers.

93 miles, 8-in., begin 1953, Cantimplora to Dorada, Colombia, William Bros. Constructors.

• **Empresa Nacional del Petroleo** — 80 miles, 6⅝-in., planned, Concon to Santiago, Chile.

Empresa de Ferrocarriles Ecuatorianos.—50 miles, 6-in., contracted, Guayaquil to Palmira, Ecuador. J. A. Jones, contractor; C.R.C. Engineering Co., engineers.

• **Governments of Southern Rhodesia and Portuguese East Africa.**—200 miles, considered, Beria, Portuguese Mozambique to Umtalia, Southern Rhodesia.

• **Petroleos Mexicanos.**—124 miles, 6-in., planned, Lagos to Guadalajara, Mexico.

54 miles, 6-in., planned, Lagos to Aguascalientes, Mexico.

82 miles, 8-in., planned, Salamanca to Lagos, Mexico.

• **Shell Co. of Australia.**—58 miles, 8-in., planned, Geelong, Melbourne to Newport, Australia.

• **Sun Pipe Line Co. of Canada.**—200 miles, 8-in., planned, Sarnia, Hamilton, Toronto, Ont.

• **United States Government.**—375 miles, 12-in., planned, St. Nazaire to Melun and Metz, France.

Foreign Natural-Gas Pipe Lines

• **Azienda Generale Italiana Petroli.**—110 miles, 12-14-16-in., Start 11-52. Cortemaggiore to Genoa. Completion date 11-53.

Azienda Generale Italiana Petroli — 90 miles, 12-in., under way, Cortemaggiore to Bologna, Italy, SNAM crews.

120 miles, 16-in., under way, Cremona Porto Mar to Ghera, Italy, Montubi, contractor.

40 miles, 12-in., under way, Ripalta-Bergamo, Italy.

Direccion General del Gas del Estado—310 miles, 8-in., under way, Plaza Huincul to Neuquen, Argentina, to the vicinity of General Conesa, Argentina.

• **Empresa Nacional del Petroleo**—80 miles, 10-in., planned, Concon to Santiago, Chile.

• **Mid-Continent Pipelines, Ltd.**—1,860 miles, 30-in., proposed, Alberta to Montreal, Canada. Fish Engineering Co.

• **Northwest Natural Gas Co.**—950 miles, 24-in., planned, Alberta fields to Vancouver, B. C., Seattle, Wash., and Portland, Ore.

Petroleos Mexicanos.—205 miles, 16-in., under way, Monterrey to Torreon, Mexico.

• **Petroleos Mexicanos.**—440 miles, 20-in., planned, Brazil to Tampico to Poza Rica, Mexico.

• **Trans-Canada Pipe Lines, Ltd. (Canadian Delhi Oil Co.)**—2,247 miles, 14 to 30-in., proposed, Alberta to Toronto to Montreal.

747 miles, 8 to 24-in., gathering system in Alberta.

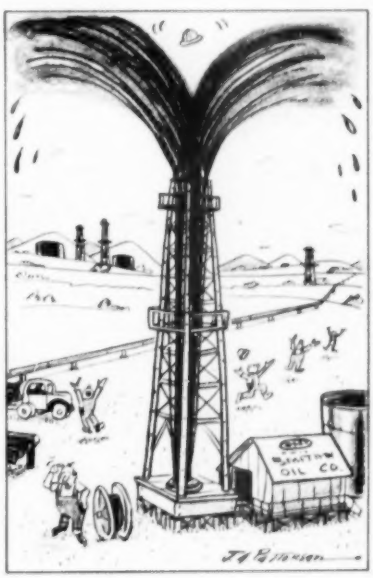
• **Westcoast Transmission Co., Ltd.**—1,110 miles, 24-in., planned, Dawson Creek, B. C., through Pine Pass and Fraser River Valley to Kamloops, Princeton, and Vancouver to Portland. Ford, Bacon & Davis, engineers.

280 miles, 20-in., planned, Pincher Creek to Montana on to Spokane, Wash. Ford, Bacon & Davis, engineers.

138 miles, 20-in., planned, Sumas to Tacoma, Wash.

139 miles, 18-in., planned, Tacoma, Wash., to Portland, Ore.

• **Western Pipe Lines.**—833 miles, 24-in., proposed, from southern Alberta, eastward across the Canadian prairies, serving principal towns and cities along the route.



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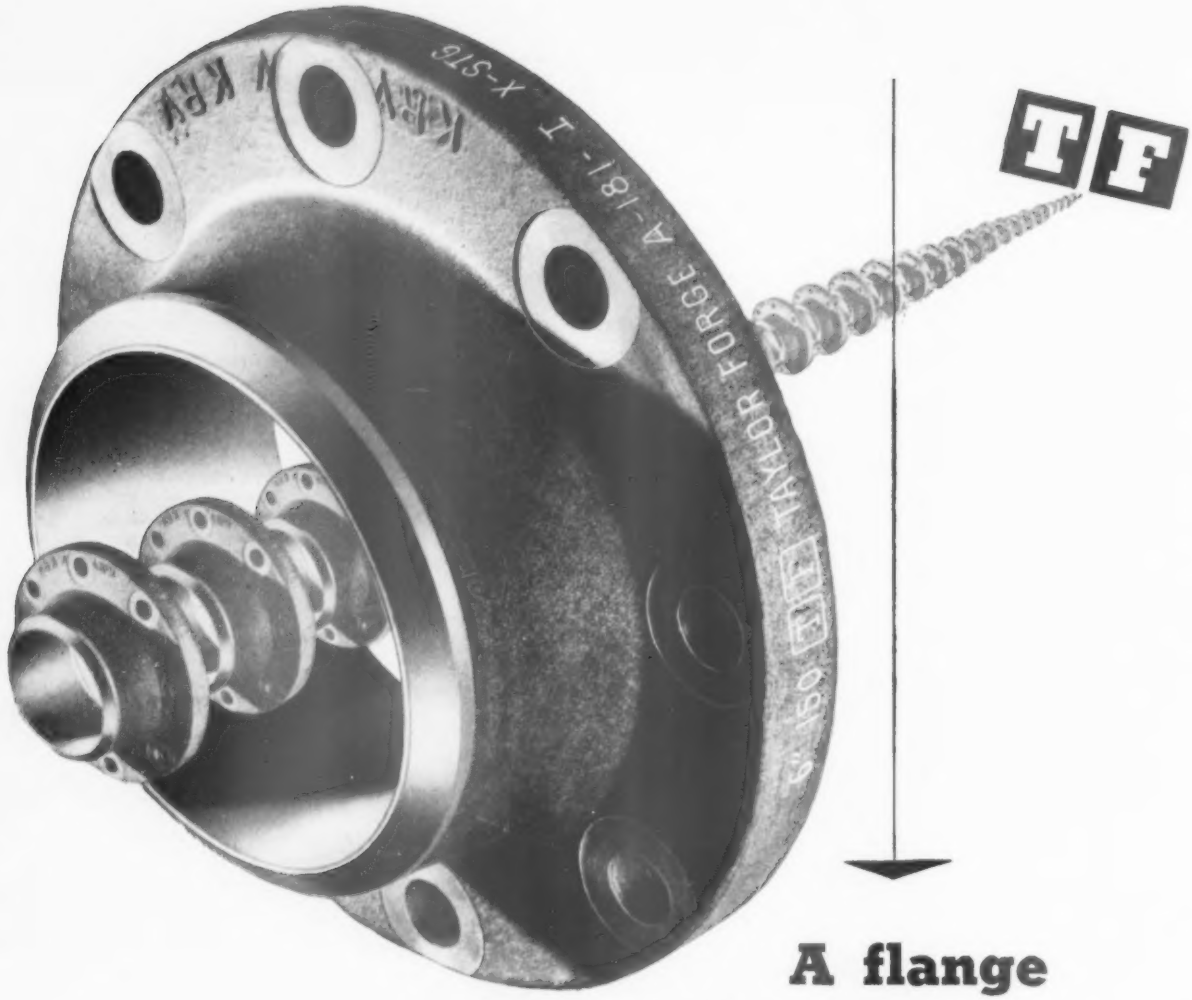

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* When pressures rose from the old 150- and 300-pound standards to 400, 600 and finally 900 pounds, it was largely the exhaustive research of Taylor Forge that supplied the formulas for determining stresses in flanges for any given condition of loading. Among many examples: the Taylor-Waters formula, published in 1927, became and still is the basis of recognized practice for flanges in sizes through 24". Again, in 1938 Taylor Forge published the first edition of the now authoritative "Modern Flange Design" based on methods proposed by E. O. Waters, D. B. Rossheim, D. B. Wesstrom and F. S. G. Williams, Taylor Forge Manager of Engineering Standards. (ASME Trans., Apr. 1937)

DIGEST OF NEW EQUIPMENT

IT'S NEW — CHECK IT

TRADE LITERATURE

1 PRICE LIST is a 32-page illustrated catalog which contains price schedules on coating and wrapping machines, cleaning and priming machines, pipe-line kettles, cutting and beveling machines, road-boring machines, welding clamps, line-up clamps, cradles, and other important pipe-line items. *M. J. Crose Manufacturing Co.*

2 "RENEWO" VALVES. This circular describes graphically dimensions and features of complete line of Renewo valves. Included are detailed views of iron-bodied Ferrenewo and bronze Renewo valves in globe and angle fullway, and throttling types and in lift checks. *The Lunkenheimer Co.*

3 CATALOG NO. 1152 describes in detail purpose and construction in type HS fittings, recommended for pressures to 3,000 psi. and temperatures to 225° F.; made in eight different styles for single, double, and triple swings. Sectional drawings, engineering and application information are given. *Rasmussen Manufacturing Co.*

4 HOBART ARC WELDING is a 40-page book containing over 100 photographs pointing out how arc welding is used profitably in 18 different industries for production, maintenance, and repair. Subsequent pages show line of arc welders, electrodes, accessories, and describes features of Hobart welders. *Hobart Brothers Co.*

5 COLCHESTER NEWS LETTER is a periodical review of latest items of technical interest relating to special application of Colchester products. Letter No. 4 discusses oil tanker equipped with Laurence Scott 100-kw. alternator set driven by Paxman 6RPHZ marine engine; RPH engine used in oil-well drilling, and two new developments in Paxman rotary vacuum filters. *Davey Paxman & Co., Ltd.*

6 PRODUCTS FOR PETROLEUM. This 15-page, multicolored, loose-leaf bulletin discusses rotary hose for drilling, transporting, refining, and maintenance; belting for drilling and pumping; brake blocks, packings, and gaskets. *Raybestos-Manhattan, Inc.*

7 GEAR-MOTORS, a 16-page, 2-color information guide describes standard types of Tri-Clad gear motors with ratings from 1/6 up to 200 hp. Cutaway photographs show relative position of parts which are distinctive to design of each motor. Adaptability to low-speed jobs and adjustable-speed drives are explained along with a description of gear-motor maintenance. *General Electric Co.*

8 HYDRAULIC LONG-STROKE PUMPING UNIT, a new eight-page bulletin, is profusely illustrated with line drawings and photographs showing in detail design, installation, operation, performance, and general specifications of this unit. Photographs showing field installations and pumping conditions are of particular interest. *W. C. Norris Manufacturer, Inc.*

9 LE GRAND O.C.T. RAM-TYPE TUBING HEAD is a four-page brochure describing with schematic drawings this compact and flexible unit which provides an efficient and safe means of suspending tubing and sealing off well pressures. Technical specifications are explained, and brochure also contains data on ram tubing head body, and bonnet and stem assemblies. *Le Grand Sutcliff & Gell, Ltd.*

10 HEMCO-MOTIVE is a gasoline-powered, instant-starting, road-able locomotive engineered to meet

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every need for spotting, moving, and switching railroad cars and on-rail equipment over reasonable distances under complete control. Application photographs and specifications are in-included in this six-page folder. *Hemco Manufacturing, Inc.*

11 THE TELEDUCER. Bulletin TC-104 describes this extremely accurate and sensitive "voltmeter" which operates upon demand, digitizes an input voltage and holds digital representation for a controllable period of time for purposes of display, recording, or any desired readout form. Digital output can be recorded by means of punched cards, an electric typewriter, magnetic tape, or punched tape. Complete specifications are given. *Telecomputing Corp.*

12 VAPOR-MIZER TANKS, a new 12-page booklet, describes operation and explains how Vapor-Mizer, either alone or manifolded to other tankage for terminal-wide protection, can combat effectively evaporation losses of petroleum in storage. Booklet also gives examples of dollar-saving potential inherent in this design. *Graver Tank & Manufacturing Co., Inc.*

13 MICROWAVE RADIO FOR PIPE LINES. Application of new 2,000-mc. microwave radio equipment to pipe-line industry is described in new booklet. Features of Type FR microwave radio and Type FJ multiplexing equipment and their importance to pipeline industry are discussed. *Westinghouse Electric Corp.*

14 DIESEL OIL-FIELD POWER UNITS. A new catalog, covering entire line of diesel engines for drilling and other oil-field uses, includes information on recently introduced Twin "6-110" diesel with newly designed GM torque converters, and other Detroit Diesel units which can be compounded to meet oil-field requirements up to 2,000 hp. Book is well illustrated with views of various models, application photographs, performance curves, and contains detailed specifications. *Detroit Diesel Engine Div., General Motors Corp.*

15 CERAMIC PLUNGERS FOR RECIPROCATING PUMPS. Bulletin W-404-B5 lists chemical and physical properties of corrosive and abrasive-resistant plungers and describes process by which they are manufactured. Bulletin includes section on recommended procedures to be followed during installation, in order to obtain best operating results. *Worthington Corp.*

16 OIL-WELL PUMPING MOTORS. New bulletin fully illustrates and covers various enclosures and electrical characteristics available. It also includes information and performance curves on triple-rated motors which provide three horsepower ratings in one motor. *Louis Allis Co.*

17 NATIONAL TYPE F-90 TRIPLEX PUMP. Bulletin No. 401 presents two new 90-hp. type F-90 triplex pumps, which lists 13 features and advantages in uses such as water flooding, salt-water disposal, oil gathering, cementing, hydraulic pumping systems, and other uses. Specifications cover 10 discharge pressures from 685 to 5,375 psi. *The National Supply Co.*

18 HOW TO GET MORE OIL. This 32-page, 2-color booklet gives a complete description of improvements and latest results with McCullough perforators. A large portion of booklet is devoted to complete report and analysis of surface penetration tests involving all sizes of improved M-3 Burrless Bullet and Glass Jet Perforators. *McCullough Tool Co.*

19 FINISH SELECTION GUIDE, a 12-page booklet, discusses finish recommendations for all protective, identification, and styling requirements in refinery service, based on extensive experience under conditions encountered in service. Easy-to-use charts spell out in detail specific primer and finish recommendations for exterior and interior surfaces. *The Sherwin-Williams Co.*

20 PIPE-LINE VENTS AND MARKERS. This four-page specification folder describes fittings that serve the dual purpose of venting and marking location and identification of underground pipe lines. Detachable brass plates can be inscribed with pertinent identification information. *Fleet-Line Co.*

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DIGEST OF NEW EQUIPMENT

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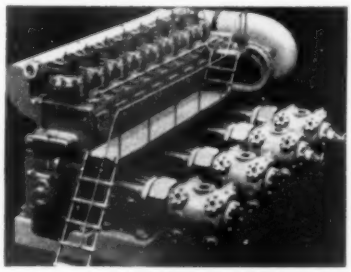
21 **NEW CLARK MODEL TRA** is a turbocharged two-cycle right-angle gas-engine-driven compressor unit. The model TRA-8 which develops 1,320-b.hp. has eight vertical, in-line cylinders of 14-in. bore and 14-in. stroke, integrally connected to horizontal compressor cylinders. The TRA represents a unitized, integrated design. Turbocharger and compressor have been specifically designed and built to operate as a perfectly matched, balanced unit. Other Clark angle compressors are now available as turbocharged units with comparable increases in power and operating economies. Some of the outstanding features include 50 per cent more power than nonturbocharged unit of comparable bore and stroke. New lows in fuel consumption; 25 per cent less water-cooling load; and flat fuel-consumption curve—fuel consumption remains practically constant between 70 per cent of load and maximum load. The turbocharger operates at conservation speeds and temperatures for extremely long life and dependability. *Clark Bros Co.*



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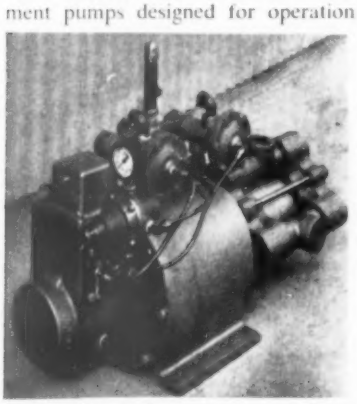
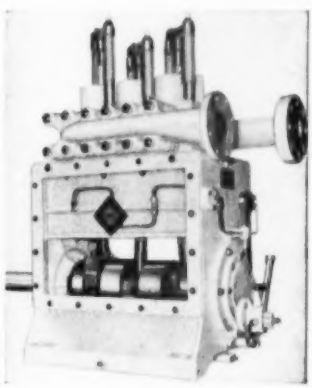
22 **HIGH-VOLUME AIR OR GAS-OPERATED TRANSFER PUMPS.** These are positive-displacement pumps designed for operation off maximum air or gas pressures of 200 psi. They are manufactured in two sizes. Series 6003, with maximum constant delivery of 13 g.p.m. and maximum discharge pressure of 2,000 psi. Series 6004, with maximum constant delivery of 27 g.p.m. and maximum discharge pressure of 900 psi. Volumes are completely selective and range upward from 1 g.p.m. The pumps are so designed that fluid is pulled in on one motion of the piston and discharged on both the forward and return strokes. This produces a smooth discharge regardless of injection pressure. Compact, lightweight, and fully portable, the pumps have unitized fluid and power ends. Fluid ends are aluminum; pistons are Niresist with steel rings; rods are stainless steel. The main housing is of high-strength aluminum, with integral legs. The pumps are equipped with pressure regulators, gages, safety valves, and all necessary fittings and connections. *Texsteam Corp.*



IT'S NEW ✓ CHECK IT

23 **TP-400 SERIES PUMP.** A new pump primarily designed for fluid injection in oil-recovery operations. Operates in a speed range of 200 to 400 r.p.m. and delivers from 429 bbl. per day at 100 r.p.m. up to 1,714 bbl. per day at 400 r.p.m. with a maximum pressure of 2,050 psi. using the 1¾-in.-diameter plunger. The maximum size plunger, 2¾-in. diameter, delivers 1,056 bbl. per day at 100 r.p.m. and 4,234 bbl. per day at 400 r.p.m. with a maximum pressure of 825 psi. Designed for continuous service, the new pump is of vertical, triplex construction which provides maximum hydraulic horsepower in minimum floor space. The entire power end of the pump is enclosed, affording weather protection and safety of operation. The fluid end is sectionalized, and separate from the power end. Straight-line flow minimizes turbulence. Tapered, double-row, factory-adjusted, roller main bearings are used for the crankshaft. A pressure system lubricates crosshead guides, crosshead pin bearings, and crank pin bearings. *Ajax Iron Works.*



IT'S NEW ✓ CHECK IT

24 **NEW REFINERY-TYPE PUMP** is designed to handle extreme ranges of temperatures, pressure, and volatility. The new single-suction, single-stage pump is available in seven sizes at capacities to 1,300 g.p.m. for pressures up to 600-ft. head, and at temperatures up to 800° F. Net-positive-suction-head requirements of the new pump are extremely low to facilitate handling of volatile

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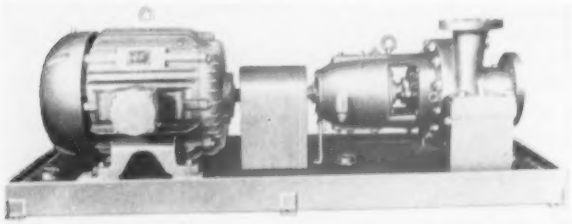
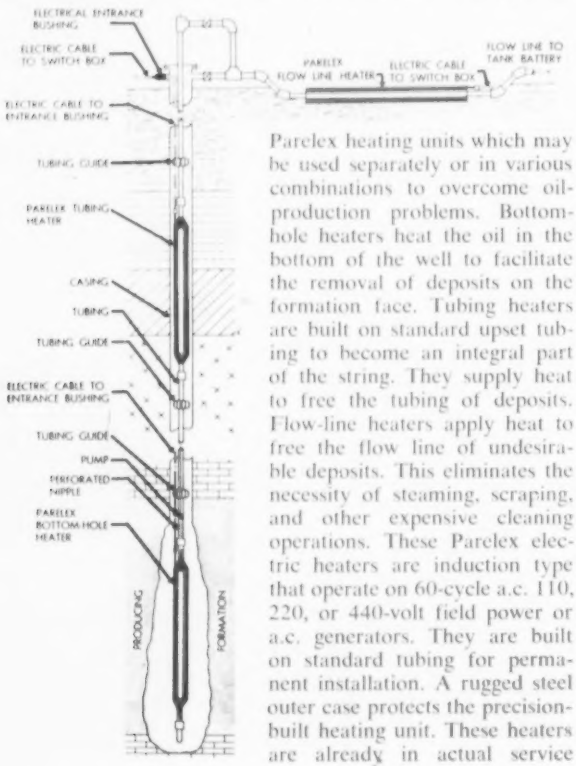
liquids at temperatures near their flash points. Double volute casings in the larger sizes (4 by 3 and 6 by 4-in.) permit operation over the wide range of heads and capacities often required in process work without excessive wear or damage to the pump. The pump has a water-cooled stuffing box and water-cooled bearings. A water-flushed smothering gland removes any danger of inflammable ma-



terial escaping and also cools the shaft and sleeve. It can be connected to the water jacket of the stuffing box by a flexible hose, needle valve, and pipe fittings. Where packing is to be used, the pump is designed to take eight rings of packing and a seal cage. This cage has in-and-out connections for sealing oil. The stuffing box is provided with renewable throat bushing and all stuffing-box pieces are faced and bored for mechanical seals. *Allis-Chalmers Manufacturing Co.*

IT'S NEW CHECK IT

25 **PARELEX** can be applied to all oil-production problems where heat is necessary for waxy or heavy crudes. The illustration shows the three different types of



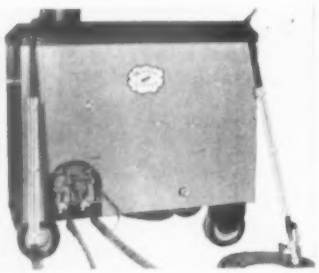
Parelex heating units which may be used separately or in various combinations to overcome oil-production problems. Bottom-hole heaters heat the oil in the bottom of the well to facilitate the removal of deposits on the formation face. Tubing heaters are built on standard upset tubing to become an integral part of the string. They supply heat to free the tubing of deposits. Flow-line heaters apply heat to free the flow line of undesirable deposits. This eliminates the necessity of steaming, scraping, and other expensive cleaning operations. These Parelex electric heaters are induction type that operate on 60-cycle a.c. 110, 220, or 440-volt field power or a.c. generators. They are built on standard tubing for permanent installation. A rugged steel outer case protects the precision-built heating unit. These heaters are already in actual service in Texas oil fields and have proved successful. *United Machine Co.*

IT'S NEW CHECK IT

26 **NEW, HYDRAULIC-OPERATED OIL-WELL PUMP** features the ability to regulate the time of the upstroke and downstroke to any desired number of seconds with a constant motor speed. The K-I Hydraulic is adaptable to any type well. It is said to increase production rate, particularly with wells with gas-oil-ratio, paraffin, heavy-crude, horsepower, emulsion, and stroke-length problems. The K-I pump cylinder screws to the well head and thus eliminates almost any expense in installation. No cement base is needed. *K-I Hydraulic Manufacturing Co.*

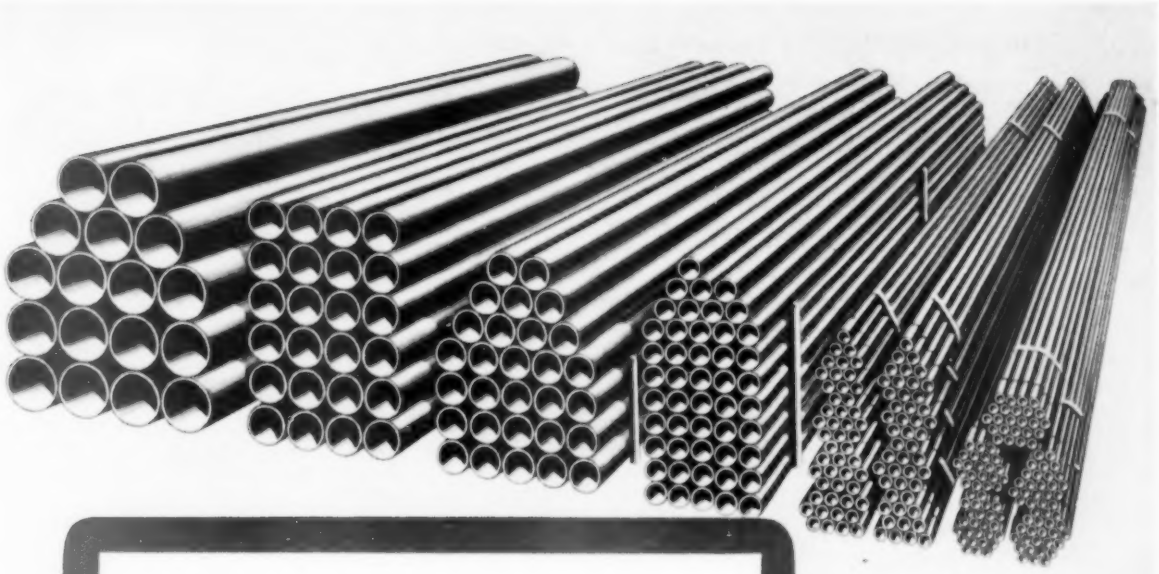
IT'S NEW CHECK IT

27 **NEW GIANT-SIZE STEAM CLEANER** has increased capacity for heavy-duty cleaning. Quick-Steam line of portable and stationary steam cleaners is large enough to operate two steam guns. It will deliver 200 gal. of combined saturated steam and cleaning detergent per hour. A force of 130 psi. drives this cleaning spray in a blast that quickly cuts off dirt, grease, or other objectionable matter. Full steam is generated from cold water in 2 minutes. Two electrical switches are the only controls. This new model, the QSA, is 59 in. high, 57 in. long, 30 in. deep, and weighs 1,050 lb. It is available either as a stationary or portable unit. *Quick Charge, Inc.*



IT'S NEW CHECK IT

28 **NEW TIPTON CLAMP WITH NO-TACK CROSS-BARS** has been newly designed to eliminate tacking and the troubles which show up in the X-ray pictures. Stringer bead can be completed before removing lineup clamp. On the all-position hydraulic clamp the hydraulic jack tightens the clamp to give the right amount of power to provide faster and better lineups. The lever releases the jack which is self-retracting. The jack has a travel of 2¾ in. which makes it quick and easy to



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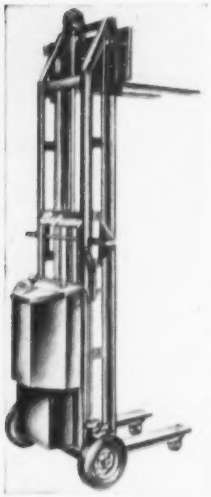
clamp around the pipe. Both the standard and the hydraulic clamps will be available with No-Tack crossbars when specified. *General Manufacturing Co.*

IT'S NEW CHECK IT



29 A POWERFUL NEW PORTABLE LIFT-TRUCK has been designed for maximum safety with one-man operation. This unit is made in three sizes with lifting heights of 68, 80, and 100 in., and has a lifting rating of 1,250 lb. The powerful hydraulic system used is powered by an automotive-type battery and is equipped with a builtin charger with automatic cutoff and trickle charge. It is equipped with an electronic switch to cut off power at maximum height and prevent jarring load and damage to hydraulic system; also hand-operated brake which will not only prevent movement of truck when loading and unloading but will brake the truck when traveling up and down inclines. While this unit is of the fork-lift type, it can be equipped with a snap-on platform to make it an all-around combination lift truck. *Safeway Industrial Equipment Corp.*

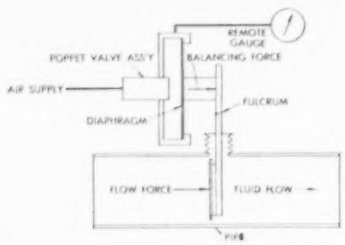
IT'S NEW CHECK IT

30 NEW AUTOMATIC SHUT-OFF SAFETY VALVE. This new valve has been designed to be particularly effective in checking fuel-fed fires. It is a quick-closing type that is normally held in an open position by an actuating head that operates like a standard sprinkler head. At the specified temperature, the head opens and releases tension on a heavy, stainless-steel spring, which closes the valve in a fraction of a second. The safety valve is explosionproof. In case debris or blast knocks off the head, the valve will immediately close. *Valco, Inc.*

IT'S NEW CHECK IT

31 TWO MAJOR IMPROVEMENTS IN GLASS JET PERFORATORS: A new Super Casing Glass Jet Perforator has been added to the line. This new perforator is for use in 5½-in. o.d. casing and larger. The addition of the new Super Casing Glass Jet now provides four different types of Glass Jet Perforators, in various sizes, to meet the requirements of every jet-perforating operation —the Standard Casing Glass Jet; the Super Casing Glass Jet; the Super Formation Glass Jet, all with steel strip carrier; and the Standard Casing Glass Jet with solid-steel body. Improvements have resulted in two-thirds deeper penetration in solid-steel with one-third less explosives. *McCullough Tool Co.*

32 FLOVANE, a new flow meter, eliminates purging or freezing of instrument lines. It utilizes the principle of flow velocity instead of pressure-drop taps. No long, straight approach and discharge are required. Normally hazardous fluids are safely metered with this new unit. The metered fluid need never leave the pipe, since indication is remote and obtained by air pressure to the indicator rather than by routing fluid to be measured through the measuring device. Flovane is explosionproof. It may be used to measure pressures from 0 up to 3,000 psi. It can be accommodated to any size pipe, and installed in any plane. In pressure-differential type of flow indication, accuracy as great as .25 per cent is obtainable. A circular vane is attached to one end of a lever arm, with a diaphragm and poppet valve at the other end. The fulcrum is located to supply the required multiplication of the applied force of flow to the operation of the diaphragm. (See illustration.) The velocity of fluid flow past the vane is the operating principle. The diaphragm and poppet valve assembly allows the required amount of air pressure to balance the flow force. *Link Engineering Co.*



IT'S NEW CHECK IT

33 IMPROVED STUFFING-BOX SAFETY CLAMP is designed for safer, more efficient use. The new, lightweight, tens-alloy, aluminum clamp is spring actuated and is self-supporting on the polished rod. It can be tightened with one hand, leaving the other hand free to support the gland. It is also sturdy enough to use in locating and supporting a heavy polished-rod grip while setting it up for pumping service, thus helping to prevent accidents sustained during this operation. The clamp is designed to fit exactly the circumference of various sizes of liners and it eliminates wear and tear caused by regular pipe wrenches used in tightening the liner stuffing box. *Paramount Equipment Co., Inc.*

IT'S NEW CHECK IT

34 MODEL PGX TUBE CLEANER is a positive-drive, high-speed hollow-rotary-shaft, air-driven, scavenger drill-type cleaner using carbide-tipped bits. Its rated capacity is for use in straight tubes from ½ to 1½-in. o.d. It weighs approximately 8 lb. and is only 11 in. over-all and consumes approximately 70 cu. ft. per minute at 90 psi. Its maximum power is derived at 90 psi. operating at approximately 3,500 r.p.m. The cleaner is suitable for both horizontal or vertical applications. It requires only one man to operate. No preliminary preparation of the tube bundle is required to clean fouled or plugged tube in minimum time. *Thomas C. Wilson, Inc.*

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Iceland
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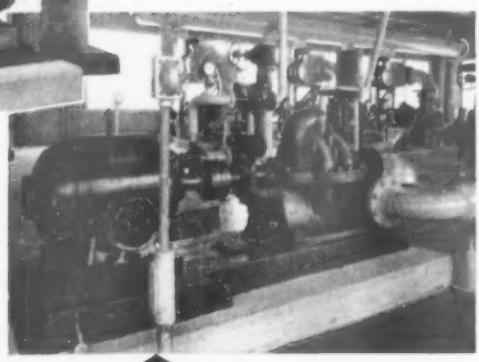
NATURAL GAS PIPE LINE COMPRESSOR STATIONS' COOLING WATER PUMPS ARE 100% PEERLESS INSTALLATIONS

One of the most recently completed natural gas pipe lines runs from Texas to Illinois. Views here show a 100% installation of Peerless pumps in one of the typical 10,000 hp compressor stations now in operation on this line. Pumps are installed in parallel batteries to handle water flow through dual cooling units. One unit cools jacket water, the other unit cools water used in heat exchange units of the lube oil cooling system.

PEERLESS SINGLE STAGE & MULTI-STAGE HORIZONTAL PUMPS HANDLE WATER TO STATIONS' DUAL COOLING UNITS



View above shows typical station arrangement of Peerless pumps installed in one of the compressor stations on the line. Single stage Peerless Type A and multi-stage Peerless Type TU pumps, both of horizontal split case design, are used to handle water to cooling systems.

View at left shows one of the multi-stage Peerless Type TU horizontal split-case pumps installed in these stations. Ample overload capacity is provided so that one or more pumps in each battery can be shut down without impairing cooling water circulation.

Write today for descriptive engineering Bulletins on both Type A and Type TU Peerless pumps.

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Among the Drilling Contractors

Active Rigs Increase to Highest Level This Year

Another substantial increase during the week in the number of active rotary rigs in the United States and western Canada boosted the total to the highest level it has been so far this year. The previous greatest number of rigs this year was reported during the first week of January. The present total of 2,811 rigs exceeds the number running at that time by 36. It still lacks 221 rigs of equalling the 1952 peak of 3,032 rigs reported running the middle of December and also the middle of June.

ACTIVE ROTARY RIGS*

Area—	Week ended 6-8-53	Change week ended 6-1-53	Change week ended 6-9-52
Gulf Coast	596	—11	— 19
N. & W. Tex.-N. M.	820	+30	—161
Ark.-N. La.-E. Tex.	130	+ 9	— 20
Oklahoma	340	— 1	+ 17
Kansas-S. Nebraska	170	— 8	0
Illinois-Eastern	141	+ 2	— 22
Rocky Mtn.	254	+13	+ 12
Pacific Coast	170	+ 2	+ 1
Total U. S.	2,621	+36	—192
Western Canada	190	+18	+ 9
Total	2,811	+54	—183

*Courtesy Hughes Tool Co. Trends in drilling activity in the United States, Rocky Mountains, and western Canada are shown on pages 207 and 208.

Within the past two weeks there has been an increase of 142 in the number of active rigs, 54 of this increase being the past week. Greatest increase during the past week was in West Texas, an area in which drilling activity has been running substantially below what it was during the first part of 1952. Drilling in the Illinois, Rocky Mountains and western Canada areas is at new high levels for the year.

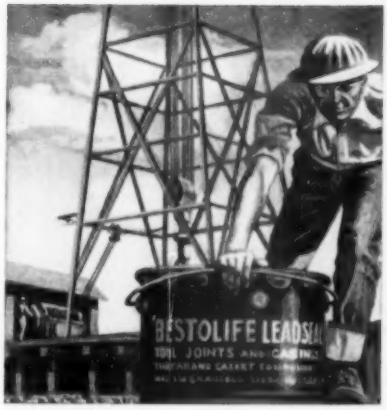
Rig Moving Time Sliced In Elk Hills Operations

Substantial reductions in time required for rig moves in the Elk Hills Naval Petroleum Reserve of California have been effected by Thomas P. Pike Drilling Co. of Los Angeles.

In the company's most recent move, the rig was released from one well at 8 a.m. and spudded its next well at 12:01 a.m. the following day, an elapsed time of only a minute more than 16 hours. This move closely followed one with another rig made in an elapsed time of 17 hours.

The previous record time for fast rig moves in the field was 23 hours,

Cities Production Corp. and associates' Devonian gas-distillate discovery well, 1 Payton, drilled by Parker Drilling Co., Tulsa, in the shallow Payton Yates sand field, 3 miles southwest of Grand Falls, in Pecos County, West Texas. In the foreground, left to right, are: F. D. Priebe, Cities Service district superintendent, Odessa; Ted Houck, Parker's Texas superintendent, Odessa; and D. D. Bodie, Cities Service division superintendent, Hobbs, N. M. The well, which broke into the news late in January when it blew out with a gas flow estimated as high as 300,000,000 cu. ft. daily (a record flow for West Texas wells), flowed 125 bbl. of high-gravity oil per day through ¼ and 1-in. chokes on recent tests.



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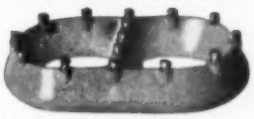

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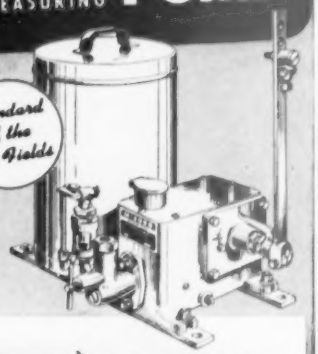
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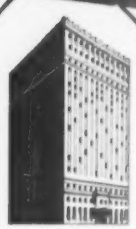
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which then was considered outstanding.

Both rigs involved in the above moves are large assemblies. The one moved in 16 hours has a Wilson Titan draw works, four 12-cylinder Le Roi engines, two mud pumps (one 18-in. and the other 14-in.), and a 138-ft. mast. The other is a complete National 75 assembly. The latter is the one with which the previous 23-hour moving record was set.

Gerald Robertson is tool pusher, and A. R. Kirkland, Richard Clayton, D. A. Peterson and Lee Robertson are drillers on the first rig. Erle Hume is tool pusher, and G. O. Meyer, Earl Leard, R. J. Mathison, and P. M. Nordling are drillers on the second.

Pike, currently, is operating three rigs in the field; all are under contract to Standard Oil Co. of California, operating company for the U. S. Navy.

Brown Drilling Co., Los Angeles, is moving in a rotary rig to drill a wildcat test for J. C. Kimble in the Bradley area of Monterey County, California. The rig is from a test recently drilled for Bolsa Chica Oil Corp. at Raisin City, in Fresno County.

Montgomery Drilling Co., El Dorado, Ark., has contracted for a Cotton Valley test to be drilled for Southwest Gas Producing Co. and W. C. Feazel at a wildcat location about 1½ miles southeast of Shiloh, in Union Parish, northeastern Louisiana. The test, 1 Hicks, C SW 28-21n-2w, is projected to 8,500 ft.

Prince Drilling Co., Houston, has a well-deepening job under way for H. J. Chavanne, Trustee, north of the Englehart field, in Colorado County, Texas Gulf Coast. The hole, 1 Bunge, drilled to 6,520 ft. by Shell Oil Co. in 1949, will be carried to approximately 9,000 ft.

Circle Drilling Co., Lake Charles, La., is starting another wildcat test, the second, for Bates & Cornell of Lafayette, La., in the Aloha area of western Grant Parish, Louisiana. The new test, 1 Fletcher, in the SW NW SE 9-7n-4w, a mile northwest of town, is about ¾ mile southeast of the operators' first test, which was quit 2 weeks ago at 6,020 ft.

Richardson Drilling Co., contractor on George W. Delker's newly completed oil-discovery well 3 miles south of Jourdanton, Atascosa County, Southwest Texas, has moved its rig a location east for a confirmation test to be drilled for the same operator. The discovery well, 1 Schorsch, produces from the Carrizo sand at 1,537-39 ft.

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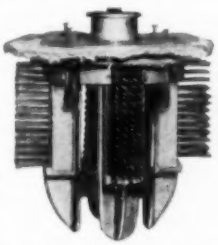

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PIPE LINES

Contract For Pipe Sale Signed

Principals in the signing of a contract for the sale of 1,600 miles of pipe and 14 pump stations by Sinclair Pipe Line Co. are shown above. Standing, left to right, are: M. E. Fannon, Tulsa; Angus Davidson, attorney, Sinclair Pipe Line Co.; Harry A. Horowitz, president, Mid-States Pipe & Supply Co., Tulsa; L. C. Rogers, Rogers & Wright, Charleston, W. Va.; Robert Thomas, president, River Construction Corp., Fort Worth; Carroll F. Zapp, attorney, Boise, Idaho; John S. Carlson of Carlson, Lupardus, Matthews & Holliman, Tulsa. Seated are W. H. Morris, president, Sinclair Pipe Line Co., and Harold A. Wright of Rogers & Wright.

Huge Salvage Deal

Sinclair selling pipe and stations of old main line

NEW YORK.—Sinclair Pipe Line Co. has announced it has agreed to sell about 1,600 miles of 8, 10, and 12-in. pipe and 14 pump stations to three companies.

The purchasers, River Construction Corp., Fort Worth; Mid-States Pipe & Supply Co., Tulsa; and Rogers & Wright, Inc., Tulsa and Charleston, W. Va., will work together in a joint venture known as Humboldt-Chicago Pipe Line Project. They will operate from the office of Rogers & Wright at Tulsa.

Removal of the pipe and salvaging of material, which together will total approximately 170,000 tons, will be carried on over a period of 3 years. Operations are expected to commence at Humboldt, Kans., in July.

Part of old main line . . . The pipe is part of Sinclair's old, multiple, mainline crude system, extending from Humboldt to Griffith, Ind., and from Carrollton to Salisbury, Mo. This has been replaced by a new 22-24-in. crude line from near Cushing, Okla., to East Chicago, Ind., recently placed into operation as part of the company's modernization program.

The pipe will be delivered to the purchasers after its removal from the ground, and the purchasers will offer the pipe for resale.

The tonnage involved is believed to represent one of the largest transactions of this nature in oil-industry history. M. E. Fannon, Tulsa, is associated with the purchasers and assisted in making the transaction. John S. Carlson, of the Tulsa law firm of Carlson, Lupardus, Matthews & Holliman, and Carroll F. Zapp, Boise, Idaho, attorney, represented the purchasers.

Northern Natural Adding Capacity at Nine Stations

OMAHA. — Northern Natural Gas Co. is installing compressor facilities of 50,560 hp. at nine stations as part of its program for increasing capacity from 735,000,000 cu. ft. daily to 1,007,000,000 cu. ft. daily by the end of this year.

The additional compressor units will raise facilities at these nine stations to a total of 189,160 hp. by the end of 1953. Furthermore contracts are to be let for compressor installations at five more stations which are to have another 47,000 hp.

For the looping program in connection with the expansion, Northern Natural has let contracts for the laying of 259 miles of pipe. *(The Oil and Gas*

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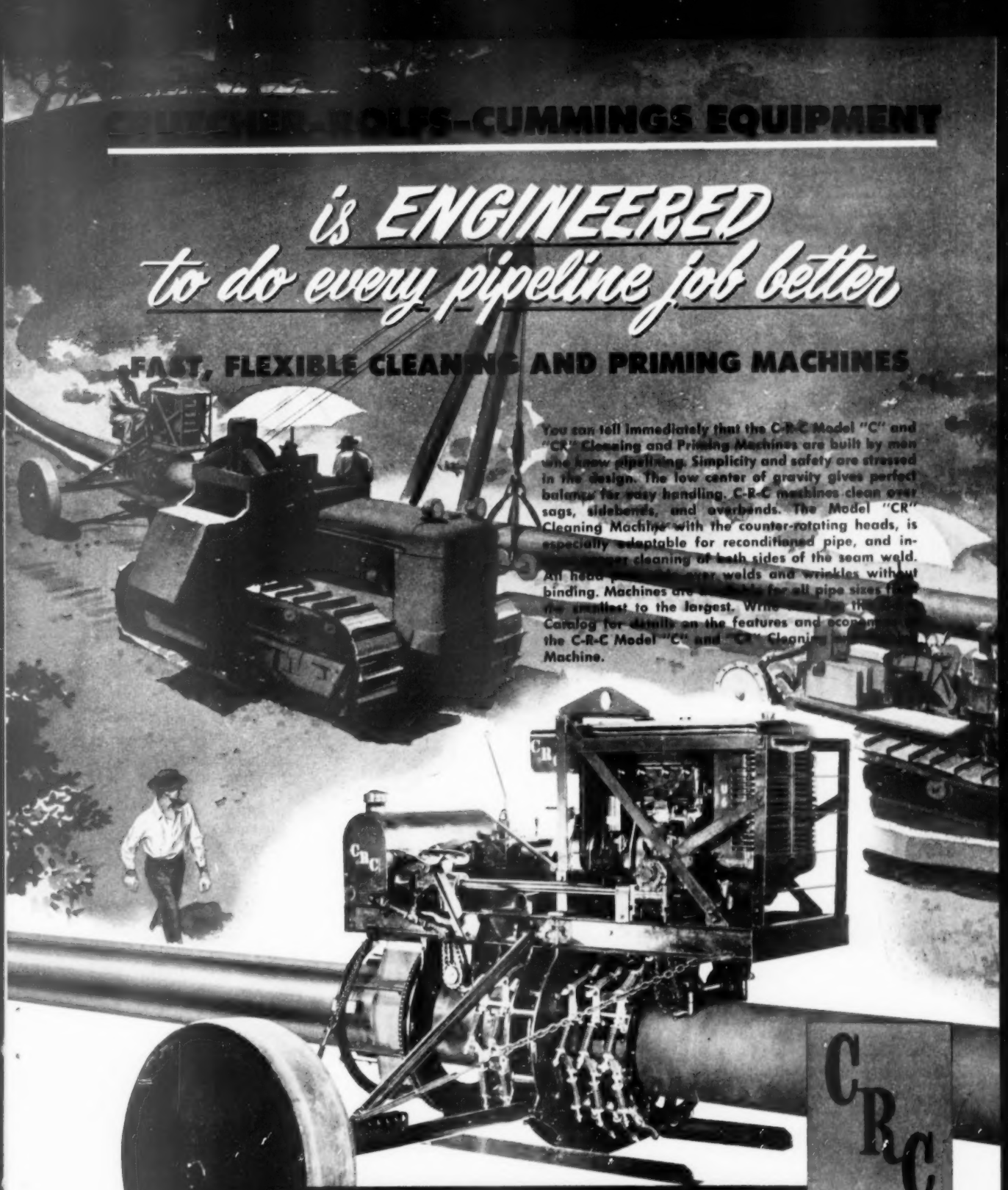
FAST, FLEXIBLE CLEANING AND PRIMING MACHINES

You can tell immediately that the C-R-C Model "C" and "CR" Cleaning and Priming Machines are built by men who know pipelining. Simplicity and safety are stressed in the design. The low center of gravity gives perfect balance for easy handling. C-R-C machines clean over sags, sidebends, and overbends. The Model "CR" Cleaning Machine with the counter-rotating heads, is especially adaptable for reconditioned pipe, and insures better cleaning of both sides of the seam weld. All heads pass over welds and wrinkles without binding. Machines are available for all pipe sizes from the smallest to the largest. Write for the C-R-C Catalog for details on the features and economy of the C-R-C Model "C" and "CR" Cleaning Machine.



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PIPE SADDLES AND REDUCERS

Nozzle sizes from 1/4" to 24" — ASTM A234

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Nominal pipe sizes 1" to 24" — ASA B16.9 ASTM A234

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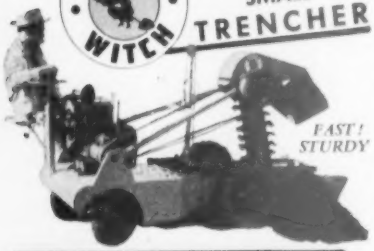

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PERRY, OKLAHOMA

Journal, June 1, page 134.) The entire expansion program to be carried on in 1953 and 1954 will cost $56,000,000.

Contracts already let for compressor additions at the nine stations include:

. . . H. B. Zachry Co., six 1,760-hp. units at Burdett; five 1,600-hp. units at Bushton.

. . . Dresser Engineering Co., three 1,600-hp., Holcomb; two 1,600-hp., Ventura.

. . . Engineers, Ltd., Pipe Line Co., one 1,600-hp., Beatrice; four 1,600-hp., Palmyra; three 1,600-hp., Clifton.

. . . Walco Engineering & Construction Co., four 1,600-hp., Oakland; three 1,600-hp., Ogden.

In addition to these projects, two 1,600-hp. units are still to be contracted at the Mullinville station. Two new stations also are planned, one between Mullinville and Bushton and the other between Bushton and Clifton. Each will have three 5,000-hp. units. In addition, the Beaver station will have three 2,000-hp. units and the Sunray station will have four 2,000-hp. units.

Hearings Get Under Way On Proposed El Paso Line

WASHINGTON.—A hearing on a proposed $214,000,000 expansion of natural-gas-transmission facilities in California and the Southwest has opened here before the Federal Power Commission.

Consolidated applications include that of El Paso Natural Gas Co. to spend $179,725,000 to enlarge its pipeline system; Pacific Gas & Electric Co., San Francisco to build $26,981,000 in new facilities; and Southern California Gas Co. and Southern Counties Gas Co. both of Los Angeles, to spend $7,482,000 for new lines.

El Paso wants to build 1,792 miles of additional pipe line and compressor facilities, to carry 300,000,000 cu. ft. of gas daily from the Permian basin, and 100,000,000 cu. ft. daily from San Juan basin.

Pacific Gas would receive 150,000,000 cu. ft. of the increased capacity, and a like amount would be delivered to the two southern California firms.

California Gas Line Planned

LOS ANGELES.—The State Public Utilities Commission has granted permission to Southern California Gas Co. and Southern Counties Gas Co. to build 73 more miles of pipe line to bring in additional gas supplies from Texas. The line, which will cost $7,482,194, will run from Blythe, Calif., to a point near Palm Springs.

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NOTED FOR Modern Design Accurate Construction

For years Lonergan Valves and Gauges have been widely used for oil field, refinery and pipe line service. Their dependable performance is well established. See your nearby Lonergan dealer for further information or write us for our Gauge or Valve Catalog.

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PROVED BEST BY TEST FOR OIL SHOW ANALYSIS! Simple to operate. Lamp weighs only 1 lb. Models available for 110 volt AC or with adapter, 110 volt DC current. Battery operated model for field use holds lamp, has built-in viewer for daylight examination. Easily portable. Send for FREE brochure OG, "How to detect and analyze petroleum in oil surface samples with ultra-violet."

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REFINING

Refinery Finished

Pan-Am boasts two "firsts" in processing at Destrehan

NEW ORLEANS.—Pan-Am Southern Corp. has completed an expansion program at its Destrehan refinery, 18 miles up the Mississippi from here, bringing capacity from 8,000 to 30,000 bbl. daily.

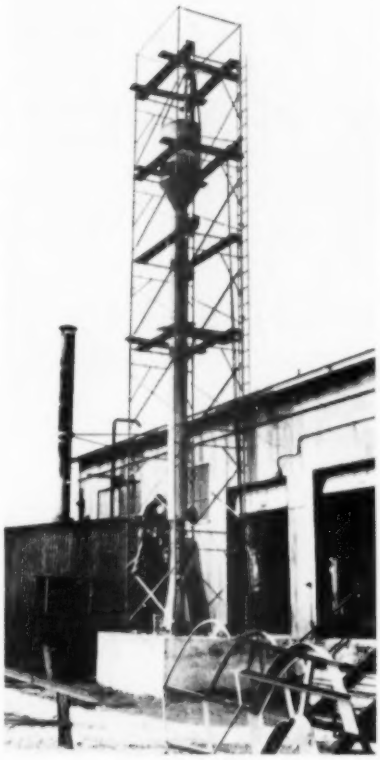
Major new processing units are a Type IV fluid catalytic cracking unit, sulfuric acid alkylation unit, fluid hydroformer, and a combination crude running-delayed coking unit. The existing crude unit was enlarged to 20,000 bbl. daily.

... The Type IV cat cracker is the first of its kind to go on stream in the United States. It was originally designed to process charge stock at high conversion with a naphtha component segregated for a blocked-out retreat operation. It is now being operated on a once-through basis, producing motor-gasoline base stock and a C_3-C_4 cut charged to the alkylation unit. Maximum feed rate has not been finally established, but throughputs averaging 15,000 bbl. daily have been realized without fully utilizing coke-burning capacity.

... The sulfuric acid alkylation unit is designed to process all of the C_3-C_4 stream from the fluid cat and the delayed coker. An isobutane deficiency is made up from purchased stocks. The reactor consists of a single horizontal vessel, with three internal emulsion circulators. The center section is an acid-settling zone and the end section is the reactor effluent zone. The charge is first treated for hydrogen sulfide removal.

... The fluid hydroformer is the first of its kind ever built and is a completely new development which extends the fluidized technique to hydroforming. This process results in a product of high octane number with higher liquid yields than are obtained from the fixed-bed hydroforming process. The feed stock can be varied over a wider range than is possible in the fixed-bed process since the small quantity of coke produced is continuously removed by regeneration.

... The crude running-delayed coking unit is designed to coke all of the reduced crude from the vacuum tower of the crude unit, together with reduced crude from the crude running-coking unit.



Steam Stripper

This steam-stripping column, now being added to ester-production facilities at the Chicago plant of Witco Chemical Co., is expected to double the plant's ester production. The new unit, which will be completed within a few weeks, also will make it possible to manufacture many new esters.

Court Rules Deer Park Cannot Annex Refinery

WACO.—Texas' Tenth Court of Civil Appeals has upheld a lower court's ruling that the little city of Deer Park, west of Houston, cannot annex Shell Oil Co.'s refinery and chemical plant.

The decision was based on a state law prohibiting cities of less than 2,000 population and 2 sq. mile area from annexing large adjoining tracts. Shell claimed the annexation would mean that the refinery and chemical plant would pay about 98 per cent of Deer Park's taxes. The plant's producing capacity is 125,000 bbl. daily.

Avgas Deficit Reported

WASHINGTON.—The Armed Services Petroleum Purchasing Agency re-

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is the "true economy" tower: efficient design, economical operation and maintenance, and low initial cost. Completely prefabricated.

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cools liquids, vapors and gases at pressures up to 5,000 psi in sizes to meet any requirement, with low first cost and low operating cost.

3 FLUOR MUFFLERS

are dependable, inexpensive mufflers for 2 and 4 cycle engines, through a broad range of makes, models and horsepower ratings. Maximum noise attenuation with minimum engine back pressure.

4 FLUOR PULSATION DAMPENERS

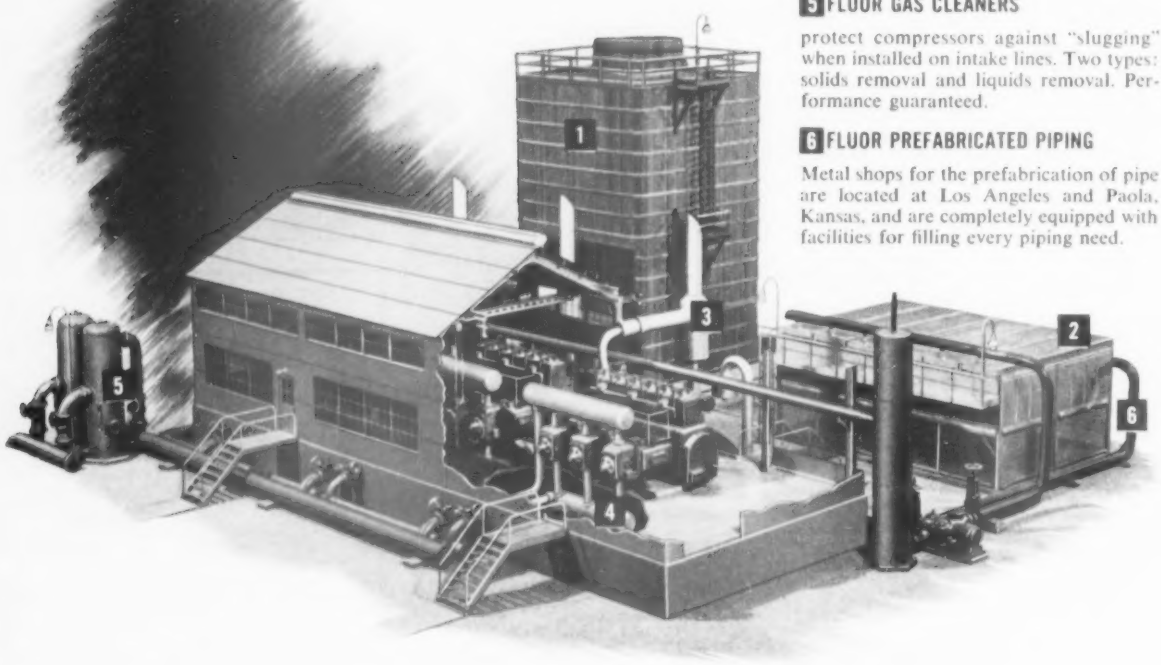
eliminate pulsations in pipe, improve the accuracy of metering and decrease plant vibration. A Fluor Pulsation Dampening System can be installed at a cost comparable to original piping.

5 FLUOR GAS CLEANERS

protect compressors against "slugging" when installed on intake lines. Two types: solids removal and liquids removal. Performance guaranteed.

6 FLUOR PREFABRICATED PIPING

Metal shops for the prefabrication of pipe are located at Los Angeles and Paola, Kansas, and are completely equipped with facilities for filling every piping need.



This miniature compressor station which was on display at the Oil Show in Tulsa, Oklahoma, shows exactly how Fluor products and services provide a compressor station with greater efficiency. The Fluor Counterflo Coilshed Cooling Tower is cooling compressed natural gas. Engine jacket water and lube oil cooling is being performed by a Fluor Fin-Fan Air Cooled Heat Exchanger. Fluor Mufflers abate engine noise while Pulsation Dampeners convert a pulsating gas flow into a steady, even stream. Fluor Gas Cleaners on the intake side of a plant remove both solids and liquids from gas, and all units are connected with Fluor Prefabricated Piping. Fluor not only manufactures these specialized products, but also contracts for the design, construction and expansion of complete compressor stations.

Wherever oil is refined, natural gas is compressed or treated, chemicals and petrochemicals are processed, power is generated, and where large-scale manufacturing is in operation—Fluor products can perform a job for you. For information on Fluor products and engineering services contact your Fluor representative or write for Catalog KC-8523.

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ports that it lacks more than 1,000,000 bbl. to fill its aviation-gasoline requirements for the current fiscal year, which ends June 30.

While there are some other product requirements yet to be filled, ASPPA officials said, the major deficiencies are 806,000 bbl. of 115/145 aviation gasoline and 266,000 bbl. of other grades.

Shell May Build Northwest Plant at Anacortes, Wash.

LOS ANGELES.—R. W. McOmie, West Coast refining coordinator for Shell Oil Co. has described Anacortes, Wash., as one of the top locations being considered for the firm's new northwest refinery. However, he said the firm also is considering two or three other locations on Puget Sound.

Preliminary plans call for construction of a plant capable of processing 50,000 bbl. of oil daily. McOmie said plant facilities would include catalytic cracking and reforming units.

Shell either owns or has options in the Anacortes area on land sufficient to build a refinery, docks, storage tanks, and other facilities.

Sinclair Plans Catalytic Reformer at Marcus Hook

NEW YORK.—A catalytic reforming unit will be built by Sinclair Refining Co. at its Marcus Hook, Pa., refinery, for production of higher-octane gasolines.

P. C. Spencer, president, said capacity would be 16,000 bbl. daily. Cost of the new unit was not disclosed.

Refining Briefs

BISHOP, Tex. — Celanese Corp. of America is now producing a new petrochemical, propylene glycol U.S.P., here in commercial quantities. The nontoxic chemical's market parallels that of glycerine for solvents, humectants, and emollients.

BORGER, Tex. — For the seventh time employes of the government-owned Plains Butadiene plant here have completed a million man-hours of work without a lost-time injury. The plant is operated by Phillips Chemical Co., a subsidiary of Phillips Petroleum Co.

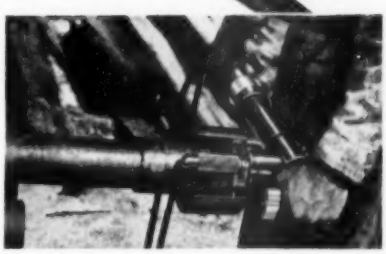
MARTINEZ, Calif.—A new safety mark of 2,000,000 man-hours of work without a disabling accident has been established at Shell Oil Co.'s refinery here. The period covered by the new record extends back to August 15 last year.

NEW

AIRETOOL JOINT CLEANER*

Now, you can clean pipe ends or threaded joints automatically, in less than 8 seconds! The AIRETOOL JOINT CLEANER* is a high speed powerful cleaner, first of its kind. Cleans either inside or outside pipe ends. Quickly reconditions and restores them to their original state. Single stage, air-driven motor of slip-fit construction. Heavy duty wire brush cuts through caked deposits. Solvent fluid is introduced to dissolve and flush away caked material. Weighs 16 pounds. Write, wire or phone for further details and illustrated literature showing how the AIRETOOL JOINT CLEANER can save time and money in your pipe reclaiming program.

Manufactured by The Airetool Mfg. Co., who also produce tube cleaners and tube expanders for every type of tubular construction, an automatic Tube Expansion Control System, and a line of oil refinery specialties.



Cleans inside threads in pipe up to 10" size. Brush guide is spring loaded, holds brush firmly against threads as it revolves.

Cleans outside threaded pipe ends or joints without any changeover of equipment. Will clean pipes up to 10" size.

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NATURAL GAS

Gas Price Ceiling Suit Dismissed by U. S. Court

WASHINGTON.—A suit by Stanolind Oil & Gas Co. and Continental Oil Co. to overthrow a ceiling-price order of the Office of Price Stabilization in the sale of natural gas from Woodlawn field, Harrison County, Texas, has been dismissed.

The Emergency Court of Appeals held that lifting of price ceilings on natural gas by OPS made the proceedings "obviously moot." The companies signed a contract with Mississippi River Fuel Corp. before price ceilings went into effect to deliver natural gas at 12 cents a thousand cubic feet.

The rate was later fixed by OPS at 10 cents a thousand. The companies filed suit against the order after their protests were rejected in hearings before the agency.

Research Conference on Hydrocarbons Scheduled

ANN ARBOR, Mich.—A 2-day research conference on "Phase Behavior of Light Hydrocarbons" will be held at the University of Michigan, July 1-2.

The session for July 1 covers six papers dealing with phase behavior and equilibrium studies.

The July 2 session includes a paper on "Application of Phase Equilibrium Data for a Rich Condensate Gas Reservoir," by E. I. Organik, United Gas Corp., Shreveport, and a discussion on future needs, methods, and application of phase behavior, with George Granger Brown, dean of the college of engineering, University of Michigan, serving as moderator.

Heading the research conference are Dr. Donald L. Katz, chairman, department of chemical and metallurgical engineering, University of Michigan, and Prof. Brymer Williams of the same department.

Natural Gasoline

Pacific Northwest Signs to Sell Natural-Gas Liquids

HOUSTON.—A contract calling for the sale of liquids from the natural gas carried by Pacific Northwest Pipeline Corp.'s proposed trunk line to Washington has been signed by Pacific Northwest and Specialty Gas Products, San Francisco.

The liquids will be extracted from gas produced from Pacific Northwest's proved reserves in the San Juan basin of northeastern New Mexico and southwestern Colorado, according to C. R. Williams, president of Pacific Northwest, and Robert E. Maloney, president of Specialty Gas Products.

It is estimated that more than 3 billion gallons of liquid hydrocarbons can be recovered from these reserves and that Pacific Northwest will realize about $150,000,000 from their sale—more than the cost of the entire pipeline project, the two presidents said.

The Federal Power Commission currently is considering Pacific Northwest's application to build the 1,400-mile transmission line. A rival application, filed by Westcoast Transmission Co. which wishes to build a pipe line from the Peace River area in western Canada, also is being considered by FPC. The newly signed contract will be valid only if Pacific Northwest's application is approved and the line built.

Pacific Northwest has signed a contract with Fish Engineering Corp., Houston, to build the proposed transmission system, pipe line, gathering lines, and a processing plant near Durango, Colo.

Warren to Begin Work on Plant Near Lovington, N. M.

TULSA. — Construction of Warren Petroleum Corp.'s Saunders natural gasoline plant about 17 miles northwest of Lovington, N. M., was to get under way this week and completion is scheduled in February 1954, the company announced.

The contract for construction of the plant has been awarded to Fluor Corp., Ltd. It will process gas from Bagley, Hightower, Lazy J, North Saunders, and Saunders pools in the northwest corner of Lea County, and any future oil pools developed in the area.

The company said initial installation will include facilities to gather and process approximately 22,000,000 cu. ft. of gas daily, with an average daily production of 30,000 gal. of natural gasoline, 15,000 gal. of butanes, and 31,000 gal. of propane. About 16,000,000 cu. ft. of residue gas will be delivered to a gas transmission pipe-line network.

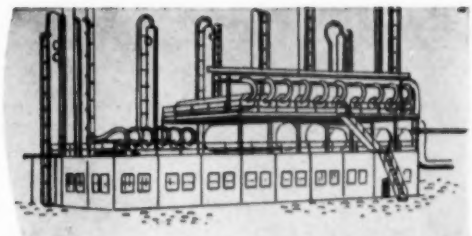
Compressor facilities will consist of five 1,350 hp. angle-type gas engine units. However, plant design provides for potential doubling of the plant's capacity by installing additional compressors and making minor equipment changes.

Light hydrocarbons will be recovered as a mixture and pumped through a 35-mile pipe line to Warren's Monument, N. M., plant for final separation and processing.

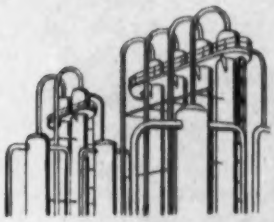
Phillips' Chocolate Bayou Plant Growing

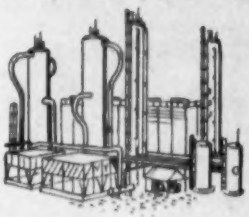
Recent expansion of Phillips Petroleum Co.'s Chocolate Bayou gasoline plant in Brazoria County, Texas, is expected to increase the plant's gas-handling capacity approximately 50 per cent. The expansion program included installation of two absorbers, four gas scrubbers, and conversion of two compressors to compress raw gas from low-pressure portions of the field to the plant's normal operating pressure of 1,000 psi.

Proof of performance:



REPEAT ORDERS for STEARNS-ROGER





Of the plants designed, fabricated and constructed by Stearns-Roger in recent years, most were repeat orders from satisfied customers.

A contract with Stearns-Roger fixes total reponsibility within one organization, covering all services from design through construction to testing and placing the completed plant in operation, including the training of operating personnel.

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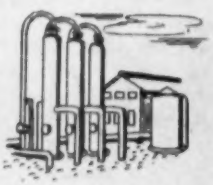

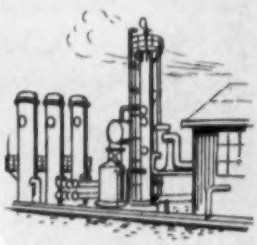

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EXPLORATION

Greatest Gas Area Grows Bigger

by Philip C. Ingalls

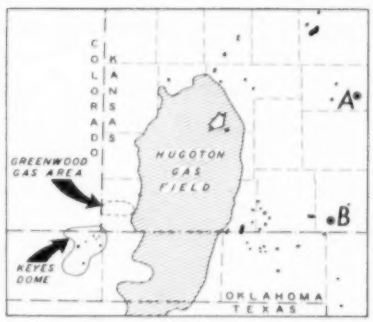
SOUTHWEST KANSAS' 25-year-old Hugoton gas field is currently in the big middle of an area of high exploratory interest and growing reserves of gas, condensate, and oil.

It can be geologically "proved" that Hugoton's existence is not dependent on large oil reservoirs at depth or in stratigraphically deeper rocks down dip somewhere. Hugoton field is an enormous stratigraphic trap on an eastward dipping homocline. The early Permian rocks in which the field's low-pressure (average 430 psi.) gas is found are often very fossiliferous, indicating that these Permian rocks may have supplied their own source beds for the dry gas found in them. Water has been encountered beneath the lowermost productive Permian dolomite in the field. Many geologists and others, however, cannot help thinking that the gas reservoired at Hugoton came from a deeper or downdip reservoir of oil and that that reservoir must be of tremendous size.

The increasing number of discoveries to the west of Hugoton in Morton County, Kansas, and Cimarron County, Oklahoma; and to the east in Seward, Meade, Clark, and Finney counties, Kansas, and Beaver and Harper counties, Oklahoma, give credence to the idea that big oil lies somewhere in the area. No "barn-burning" discoveries have been indicated yet, but it continues to look as though this little-known area of northward converging Pennsylvanian and Mississippian rocks is building up to something big.

The most promising objective in the area so far appears to be the basal Pennsylvanian-Morrow sand which some correlate roughly with the prolific Springer formation of South-Central Oklahoma. There are a multiplicity of pays in this area, however: the Topeka, Lansing, Marmaton, and Cherokee of Pennsylvanian age; and the Chester of Mississippian age. Knowledge of the Mississippian rocks below the Chester is very sketchy.

Toward the latter part of the last year one of the few deeper-pool tests ever drilled in Hugoton field was completed in the Marmaton for 191 bbl. of oil daily. This well, Coppinger 1 Beyer, 24-33w-26s, arrowed on sketch, was drilled into the Mississippian to 5,275 ft., but was plugged back for completion in the Marmaton at about 4,400 ft. There has been no further deep development in the immediate area of this discovery which is reported to be cutting considerable water.



Environs of Hugoton field.

Just to the west of Hugoton is the Greenwood gas area opened in 1951 by a Morrow well. Late last year Cities Service 1 Boehm "A," 11-33s-42w, unexpectedly found the Topeka productive. The well was completed at 2,988-3,158 ft. for 15.8 M.M.c.f. of gas daily. This Topeka development has spread rapidly until now it covers most of the two townships between the western edge of Hugoton field and the Colorado line.

South of the growing Greenwood area, activity on the Keyes dome has been revived as a result of two gas discoveries to the northeast of the two small Keyes pools. Here production is found in basal sandstones of the Morrow group at depths of 4,100 to 4,800 ft. with gas flows ranging from 5 million to 15 million cubic feet daily. This new area is being developed on 640-acre units with reserves per unit estimated at just short of 4 billion cubic feet.

On the east side of Hugoton field exploratory drilling in Seward and Meade counties, Kansas, and Beaver County, Oklahoma, continues to find large gas-condensate discovery wells to open pools of limited areal extent.

Over in Clark County, I. W. Siegel et al 1 Theis, 18-34s-24w, B on sketch, has recently opened a Chester gas pool at 5,660-80 ft. Gas flow was estimated at 30 M.M.c.f. daily.

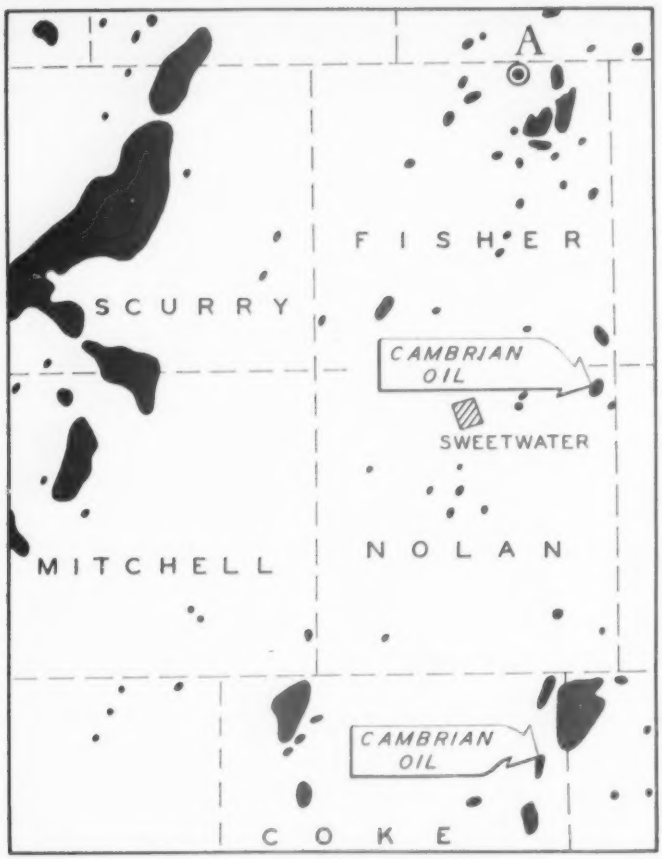
Up in Hodgeman County, Atlantic Refining Co. 1 Hall, 36-23s-22w, A on map, was completed for a pump potential of 635 bbl. of oil daily from the Marmaton at 4,284-95 ft. This well is about 14 miles east of two Mississippian pools, Jetmore and Purdyville.

The search for oil and gas in Southwest Kansas and the Oklahoma Panhandle is a search for porosity and there are still many problems of correlation to be mastered before this search can become as efficient as desired.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

WEST TEXAS . . . Dual completion from the Ellenburger and the Devonian has been assured at Anderson-Prichard 1-E University, northeast Andrews County wildcat. Top of the Ellenburger at 13,479-13,510 ft. flowed 43 bbl. hourly. The Devonian between 12,322 ft. and 12,382 ft. yielded 524 bbl. in 6 hours. Gulf Oil Corp. 1 Lea, Crane County wildcat, gaged 461 bbl. of oil in 4 hours from additional pay in the Ellenburger.

ROCKY MOUNTAIN . . . Sun Oil Co. and Phillips Petroleum Co. are swabbing and cleaning out at 1 Dynneson, C SW NE 32-24n-58e, Bronson area wildcat in Richland County, Montana, after reperforating from 12,585-12,605 ft. Sherrod & Apperson have completed 1 Endsley, NW NW NE 6-3n-60w, Morgan County, Colorado, for a pump gage of 25 bbl. of oil daily from the Greenhorn. This is the first production from this formation in the Denver-Julesburg basin.



Relative position of assured second Cambrian-Hickory sand producer for West Texas. Top arrow points to American Trading & Production Corp. 1 Little, in the process of completion.

Second Cambrian Sand Discovery Looms in West Texas Border County

by Carl Hoot

A SECOND Cambrian discovery appears assured for the archipelago of buried granite peaks which runs north-south near the eastern sides of Coke, Nolan, and Fisher counties along the easternmost limits of West Texas.

The indicated discovery is American Trading & Production Corp. 1 Little, located 12 miles east of Sweetwater in 25-20-T&P Survey. This well, now checking electrical surveys run to 5,697 ft., total depth, has logged a total of 198 ft. of Cambrian-Hickory sand pay from the top at 5,457 ft.

A drill-stem test of the interval 5,454-67 ft., 10 ft. into the Hickory sand, had gas to the surface in 2 minutes and flowed oil in 9 minutes. The well was allowed to flow into pits for 2 minutes, at a rate which was not estimated, before it was shut in. Fluid in the drill pipe, which contained no formation water, was reversed out. Flowing pressure during the test was 1,325 psi. A 30-minute shut-in pressure reached a maximum of 2,225 psi.

Following the test, the well was cored ahead to 5,567 ft., recovering 100 ft. of oil-saturated sand. Cores from 5,568-5,619 ft. added another 50 ft. of fully saturated oil sand with no water. Cores from 5,620-58 ft. yielded 35 ft. of oil-saturated Hickory sand and 3 ft. of metamorphosed dolomite.

Following the last core, operators went back into the hole with a hard-rock bit and drilled to 5,697 ft., total depth. All of the section between 5,658 ft. to total depth was metamorphosed dolomite, with breaks of pink quartzite. Drilling became so hard, cutting as much as 80 minutes to the foot, that it was decided to halt drilling and run electrical surveys.

American Trading & Production Corp.'s assured discovery is in White Flat field (north arrow on map) and its successful completion will give that field its sixth producing zone. Other formations producing at White flat are the Strawn, Caddo, Caddo conglomerate, Odom limestone, and Ellenburger.

The Hickory sandstone, as found in Central Texas, is characteristically 150-250 ft. thick, massive, with white to buff, fine pebbly sandstone above and coarse conglomerate below.

The only other well to have penetrated the entire Hickory section, into granite, is Phillips Petroleum Co. 1 Collan, drilled in 1945-46, on the Schleicher-Menard county line about 115 miles to the south. This well had nearly 500 ft. of Hickory section, and operators of 1 Little are using that well for geologic control.

The only other producer from this sandstone at the present time is found at North Bronte field (south arrow on map) 40 miles to the south in Coke County. This producer, Humble Oil & Refining Co. 3 Butner, was completed earlier this year for 301 bbl. of high-gravity oil daily from a Hickory pay section at 5,541-53 ft.

Other wells in the Bronte area have indicated oil in the Cambrian sandstone but none has been completed in that section to date. The only other Cambrian oil in West Texas was developed by Gulf Oil Corp. in Wentz field of Pecos County about 11 years ago. That discovery has since been depleted, leaving Humble's well at North Bronte the only Cambrian producer.

Fisher County strike . . . Flush production from the Strawn reef was found at A. W. and Blair Cherry 1 Nettie Bailey, 114-1-H&TC, A on the map, in the northeast corner of the county.

Top of the reef was 5,230 ft., on ground elevation of 1,861 ft. Completion potential of 2,016 bbl. daily was calculated on the basis of a 6-hour flow test through ½-in. choke. Total depth was 5,265 ft. Completion was from perforations at 5,230-60 ft. and open hole between 5,260-65 ft.

No. 1 Nettie Bailey is first reef production in the area, and is one location southeast of the Flippen sandstone (base of the Wolfcamp) discovery of Ida field. Established production a few miles to the east and west, runs to 3,700 ft.

Reference

Nolan County Offers Promising Prospects, The Oil and Gas Journal, February 9, 1953; North Bronte Activity Quickens, March 16, 1953.

KANSAS

Wildcats Reported In Western Kansas Areas

In Decatur County in northwestern Kansas at the northern end of the Central Kansas uplift Walt H. Sauvage is below 2,000 ft. at a new test 3 miles northeast of new Pollnow pool. The 1 Sauvage is located in the SW SW NW 36-2s-29w, ½ mile north of town of Oberlin.

Off the western flanks of the Central Kansas uplift in the upper area of the Hugoton embayment Anschutz Drilling Co. is making hole below 1,990 ft. at 1 Thies, SW SW SW 24-15s-30w, Gove County. The wildcat is located 2 miles west of Jasper pool and 4 miles south and 1 mile west of Lundgren in the southwestern part of the country.

Five New Pools Opened In Kansas Areas

Kansas continues to have an active year in successful wildcatting with five new pools reported.

In southern Kansas Enterprise Southwest is a new pool for Cowley County. The pool was opened at Drillers Production 1 Godfrey, NW NE NE 3-34s-3e. The well was finaled in the Bartlesville for 42 bbl. of oil per day. On the Central Kansas Uplift Don Pratt opened Wheatland Northwest pool at 1 Stecklein, SE SE SE 12-15s-18w, Ellis County. The pool produces from the Arbuckle. Champlin Refining Co. has a pool opener or extension at 1 Henderson "B," NE SE SE 10-26s-14w, Pratt County. The well was completed for 237 bbl. of oil daily from the Kinderhook.

Two new discoveries have been completed in the Hugoton embayment area of southwestern Kansas. In Hodgeman County Atlantic Refining Co. opened Saw Log Creek pool at 1 Hall, C NW SE 36-23s-22w. The well was completed with a pump potential of 635 bbl. of oil per day from the Marmaton. In Meade County Columbian Fuel Corp. has an indicated Kismet East pool extension at 1 Meyer in C SW NE 20-33s-30w. The well was completed for 138 bbl. of oil per day from the Mississippi.

Stafford Strike Goes on Pump

A new discovery in the northwestern part of Stafford County on the Central Kansas uplift is being put on the pump after swabbing 18 bbl. of oil per hour natural.

The pool opener is Westgate-Greenland Oil Co. and Sinclair Oil & Gas Co. 1 Estes, NE SE NW 5-22s-14w. The wildcat, which was drilled as a tight hole, is located 1 mile north of Strobel Northwest pool. A drill-stem test in the Lansing at 3,562-78 ft. recovered 1,680 ft. of gassy oil, 60 ft. frothy oil, and 60 ft. oil and gas-cut mud. A test in the Arbuckle at 3,853-61 ft. recovered 2,070 ft. gassy oil and 60 ft. muddy oil. A second Arbuckle test recovered 250 ft. gas, 930 ft. clean oil and 60 ft. muddy oil.

South Flank of Uplift Gets Seven New Tests

The south flank of the Central Kansas uplift, one of the year's most active spots in Kansas, has seven new wildcats staked.

Pawnee County leads with four new tests. Musgrove Petroleum Corp. and A. F. Brann are drilling at 1 Fox, NE NE NE 36-20s-19w, 4½ miles southeast of Oro pool in the northwestern part of the county. Sunray Oil Corp. is rigging up at 1 De Roo, NE NE NE 17-21s-16w, 3 miles northwest of Larned pool, a very active area. Stanolind Oil & Gas Co. have location for a test at 1 Stolz, NE NE NW 12-22s-15w, 3½ miles northwest of Dunes pool in the eastern part of the county. Vickers Petroleum and Carl Todd Drilling Co. and drilling 1 Flick, NW NW NW 10-22s-16w, wildcat 1 mile south of Larned pool.

Pratt County has three new wildcats. Helmerich & Payne have spudded in at 1 Hertlein, SE SE NW 22-28s-13w, 3 miles northeast of Ludwick pool, and 2½ miles south of the town of Pratt. In the western part of the county Flynn Oil Co. is drilling below 2,000 ft. at 1 Thompson, NE NE NW 22-28s-15w. The rank test lies 10 miles northwest of Shriver pool. Near Shriver pool Skelly Oil Co. has staked 1 Eubank, NW NW SE 32-29s-14w.

TEXAS

WEST TEXAS

Multiple Discovery Flows Ellenburger Oil

Gulf Oil Corp. 1-EH State, Crane County wildcat north of Crane, topped the Ellenburger at 11,908 ft., minus 9,408 ft., and flowed 58 bbl. of oil in 6 hours on its first drill-stem test from 11,912-11,962 ft.

Total time on the above test was 7 hours and 38 minutes. Gas surfaced in 6 minutes and fluid in 1 hour and 33 minutes. Recovery below the circulating sub was 514 ft. of oil and gas-cut mud, with no water.

A second test in the Ellenburger established the water table. Recovery on a 3-hour test between 11,962-12,012 ft. was 9 ft. of heavily oil and gas-cut mud, and 1,440 ft. of sulfur water. Operators were running electrical surveys.

Previous tests established flowing production from the lower Tubb zone around 6,600 ft., and in the Waddell sand at 11,691-11,751 ft. Field reports said completion would be attempted from the Waddell and the Ellenburger.

Deep development . . . Magnolia Petroleum Co. 5-16 University, ¾ mile due south of Gulf and Stanolind's 1-EH discovery, on the east side of the McElroy field, will be drilled ahead to 12,000 ft. Previous projected depth was 7,000 ft.

Gulf 1 Lea . . . A heavy flow of Ellenburger oil was developed at this central Crane County wildcat. On drill-stem test from 8,317-50 ft. oil reached the top in 15 minutes, flowed into pits for 5 minutes, then tanked 461.3 bbl. of clean oil in 4 hours. Choke size on the test was not reported. A previous test from 8,230-48 ft. flowed 212.5 bbl. of oil in 6 hours through ½-in. choke.

A drill-stem test from 8,248-86 ft. tanked 1,195 bbl. of clean oil in 11 hours. At total depth of 8,317 ft., the well had logged 185 ft. of pay section in the Ellenburger.

Andrews County . . . Anderson - Prichard Oil Corp. 1-E University, 5 miles northeast of Northeast Andrews field, made a heavy flow of oil from the Devonian, then on a retest of the Ellenburger, had prospects of making a dual producer.

The Devonian was tested through perforations at 12,322-12,350 ft. and from 12,360-12,382 ft. In 6 hours, through various size chokes, the well flowed 524 bbl. of oil. Nearest Devonian production is 3½ miles to the northwest.

First Ellenburger tests on perforations at 13,670-13,680 ft. had flowing oil and water, with the water cutting out the oil. Last set of perforations from 13,479-13,510 ft. started flowing after being swabbed 3½ hours and gaged 86 bbl. of oil in 2 hours, cutting 2 per cent salt water. The flow was through 1-in. choke.

J. R. Sharp 1-A University, south of Anderson-Prichard 1-E University, was drilling ahead below 12,595 ft. after developing clean oil on second drill-stem test of the Devonian. First test at 12,385-12,427 ft. recovered oil and gas-cut water blanket, but the second interval between 12,427-12,510 ft. returned 300 ft. of clean oil and 420 ft. of oil and gas-cut mud.

EAST TEXAS

Deep Test Near Goal; New Work Scheduled

Outcome of Gulf Oil Corp. 1 S. W. Lollar, Van Zandt wildcat southeast of Martins Mill, was believed near. Unofficial reports credited the well with reaching its objective, the Smackover limestone. It was drilling ahead below 13,425 ft. at last report.

Humble Oil & Refining Co., which is said to hold considerable acreage on the east side of Smith County, has scheduled a 9,000-ft. wildcat for early drilling. The venture will be 1 Hubbard Timms, located on a 160-acre tract in the George Slaughter Survey, about 8 miles northwest of Kilgore. It will test the Travis Peak. Offset acreage is held by Shell Oil Co. to the west, and Gulf on the south.

Watson W. Wise announced plans for an 8,000-ft. wildcat in western Houston County, seeking Woodbine pay. The new venture will be 1 Talford Scott and location was said to be in the J. J. Haile Survey, A-40.

Lester & Culbertson, Marshall, have announced plans for an 11,000-ft. San Augustine County wildcat, to be drilled as the 1 J. T. Childers. Location is in the Chichester Chaplin Survey, about 21 miles south of San Augustine.

TEXAS GULF COAST

Second Well Completed At East Robinson Lake

Confirmation of gas-condensate production opened by Standard Oil Co. of Texas in the East Robinson Lake area of Chambers County last August has been made with the completion by Phillips Petroleum Co. of its 1 Wilburn, second well in the area.

Phillips' well, located in the William Moore Survey, a half mile southwest of the discovery well, flowed 252.48 bbl. of 58.8°-gravity condensate with 5,880,000 cu. ft. of gas daily through 18/64-in. choke on a 24-hour potential gage. Tubing pressure flowing was 3,005 psi.

Production is from casing perforations at 10,438-46 ft. opposite Frio sand. Standard's discovery well, 1 White, completed in the Frio pay with casing perforations at 10,346-57 ft., flowed at the rate of 25,750,000 cu. ft. of gas daily on open-flow potential tests.

Woodbine Produces In Grimes County Wildcat

Completion of a Woodbine well in Grimes County, one of the inland Gulf Coast counties of southeastern Texas, marks another coastward extension of production from the formation which has been the prolific source

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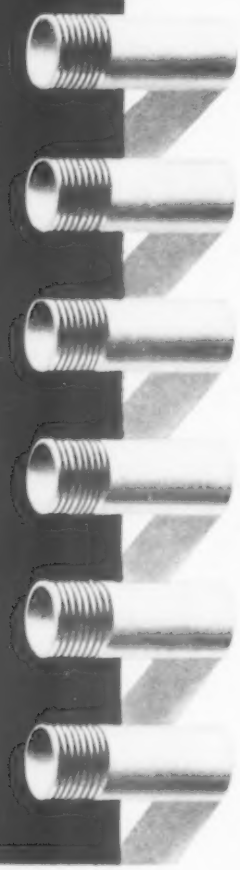

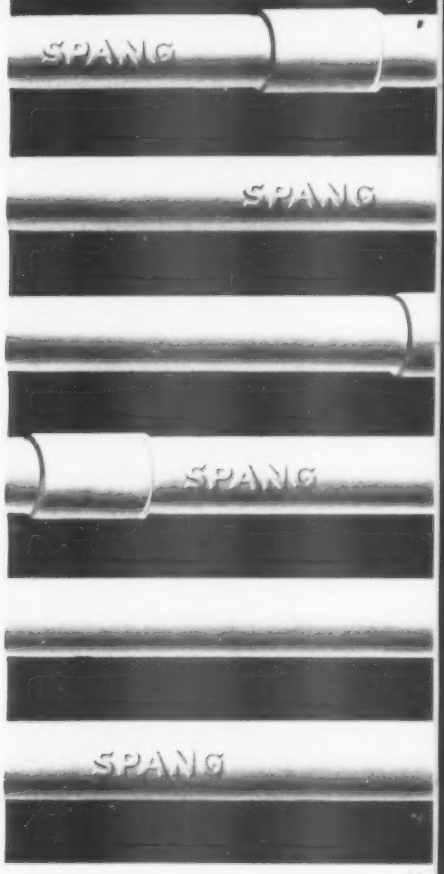

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of production in the East Texas and many other East Central Texas fields.

The new discovery was made by J. M. and Wesley West at their 1 Harrison, a rank wildcat, located in the A. B. Dodson Survey, 6 miles north of Bedias, in the extreme northern part of the county. The well, producing from the Dexter zone in the lower Woodbine, flowed 204.6 bbl. of 29°-gravity oil with 107,000 cu. ft. of gas on a 24-hour potential gage through ¾-in. choke. Pay zone is at 9,320-28 ft. Flowing pressure on the tubing was 1,000 psi.

Location is approximately 25 miles southwest of the Fort Trinidad field, on the Madison-Houston county line, where Woodbine production lately has been indicated. The prospective Woodbine dicovery well in that field encountered favorable oil showings in the Dexter zone at 8,605½-21½ ft. (The Oil and Gas Journal, June 8 issue, page 168.) That well, Woodley Petroleum Co. and Moran Corp. 2 Bruton, currently is being deepened to the Buda and Georgetown formations, present producing horizons in the field.

Newly Opened Duke Field Extended Mile Westward

The recently discovered Duke field, southwest of El Campo, in Wharton County, has assumed greatly increased importance with completion of its second well, located a mile west of the discovery producer, indicating a sizable productive area.

The field was opened last month by Texas State Drilling Co. at 1 Hahl, located 2½ miles southwest of El Campo, which flowed 118.25 bbl. of 41°-gravity oil daily from casing perforations at 6,276-82 ft. in Frio sand. The second well, 2 Nilson, just completed by the same company, is a gas-condensate well with casing perforated at 6,186-94 ft. and 6,197-6,200 ft. On open flow tests, it produced at the rate of 18,000,000 cu. ft. of gas daily with a gas-fluid ratio of 20,000 cu. ft. per barrel.

The same company now is starting another well, 1 Swanson, located approximately 3,600 ft. south and a little west of the discovery producer.

SOUTHWEST TEXAS

New-Field Oil Discovery Made in South Taft Area

A new oil-producing area, discovered by Ben F. Vaughn, Jr., and F. P. Zock, has been opened ¾ mile southwest of the South Taft field, 2 miles southwest of Taft, in San Patricio County. The discovery well, 1 Picha, on potential gage, flowed 161.61 bbl. of 42.5°-gravity oil in 24 hours through ⅛-in. choke from Frio sand, opposite which casing is perforated at 7,300½-02½ ft. Flowing pressure on the tubing was 1,400 psi., and gas-oil ratio 577 cu. ft. per barrel.

The new area, designated tentatively as the Picha field, is separated from the South Taft field by a fault. The latter field, in which two producing wells have been completed, was opened last February by Phillips Petroleum Co. The discovery well, 1-A Flinn, produces from casing perforations at 7,185-92 ft., approximately 100 ft. higher than the Picha well. Phillips' second well, completed in March, confirming the discovery, and located 980 ft. northwest, has pay interval at 7,200-02 ft. Since then, Phillips has drilled an east offset, 1-A Cunningham, completed the past week as a dry hole at 8,585 ft.

Heep Oil Corp. and others now are starting a well, 1 Cunningham, at a location 1,250 ft. southeast of the Phillips discovery well and 950 ft. south of the lately completed dry hole.

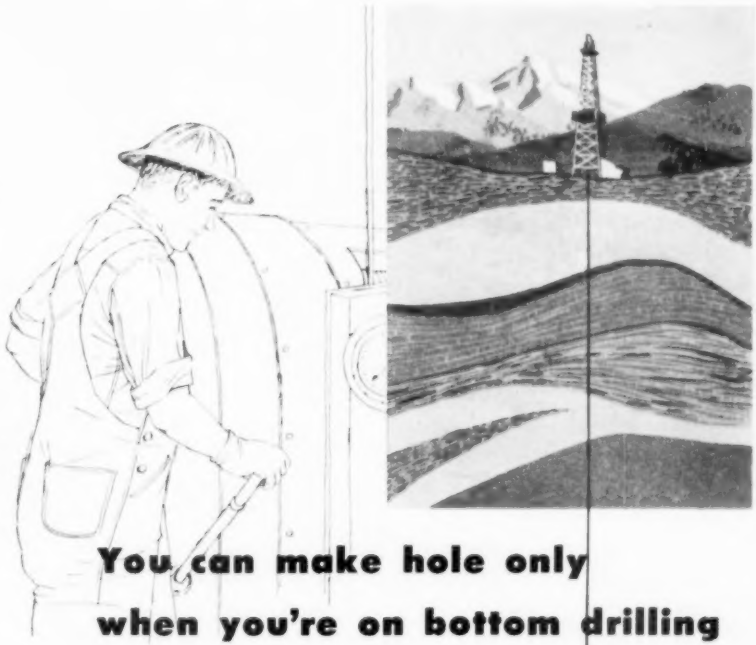
Development Expands in New Silver Lakes Field

Development of the recently opened Silver Lakes field in Jim Hogg County is being expanded with three new operations getting under way, two by Quintana Petroleum Corp. of Houston and one by Southern Minerals Corp. of Corpus Christi.

The field, located 9 miles southwest of Hebronville, now has two producing wells, both in Frio sand. The discovery well, 1-A Silver Lakes Ranches, drilled by Southern Minerals Corp., was completed the latter part of April flowing 73 bbl. of 44°-gravity oil per day through 10/64-in. choke from pay at 4,125-31 ft. (casing perforations).

Southern Minerals' second test, 2-A, a 933-ft. location north of the discovery well, was dry at a total depth of 4,166 ft. Its third test, 3-A, 933 ft. south of the discovery well, flowed 77.24 bbl. of oil in 24 hours through 10/64-in. choke from perforations at 4,114-20 ft. The fourth test, 4-A, 933 ft. south of 3-A, also has proved a failure at 4,150 ft.

New operations are Southern Minerals 5-A Silver Lakes Ranches, 1,800 ft. south-southwest of the 3-A producer, and Quintana 2 Silver Lakes Ranches, 797 ft. east of Southern Minerals's 3-A, and Quintana 3, 797 ft. east of Southern Minerals's 1-A discovery well. Quintana's first test, 1 Silver Lakes, 1,980 ft. to the east, was drilled prior to the discovery of the field.



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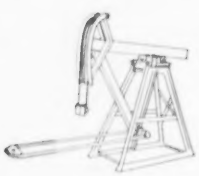

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CANADA

New Additions to Fort St. John Gas Reserves

Pacific Petroleums, Ltd., and associates have added to their natural gas reserve in the Fort St. John area of northeast British Columbia, at a 2½ mile extension venture located 1¾ miles due north of Fort St. John town.

The new success found its gas in top of the Triassic formation, and is now continuing to core ahead in search of three other prospective horizons in that formation. The well is Pacific 19 Fort St. John, LSD 12, 7-84-18w6, 2½ miles east-southeast of Pacific No. 5 gas well and slightly less than that distance northwest of No. 25 which found only moderate gas flows in the Triassic (maximum around 500,000 cu. ft. daily).

The 19 Fort St. John ran two drill-stem tests in the upper Triassic. First 1-hour test, from 3,848-69 ft., flowed gas at rate 62,000 cu. ft. daily. Second test, 1½ hours in duration, flowed gas at maximum rate 1,930,000 cu. ft. daily. Flowing pressure was 500 psi. It is expected that the zone tested would produce at a much higher rate after acidization, as it has been found that the Triassic dolomite formation yields from 8 to 10 times the rate of drill-stem tests after being treated with acid.

Antelope Lake... Socony-Vacuum Exploration Co. has encountered oil encouragement in the Jurassic formation at an exploratory driller in the Antelope Lake area of southwest Saskatchewan. This well, which previously rated some oil-flecked mud in the Blairmore and clean oil in the Roseray sand, lies on farmout lands acquired under agreement from Woodley Canadian Oil Co. and Southern Production, Inc. The well is 28 miles due west of Swift Current.

The oil showings came at Socony-Woodley-Southern 5-3 Antelope Lake, LSD 3, 5-16-18w3, 2½ miles northeast of the North Premier No. 30-4B oil discovery well and 7 miles south of production in Fosterton field.

Drill-stem test in the Blairmore interval 3,066-74 ft. gave up some oil-flecked mud. In the Roseray sand, 1-hour test from 3,135-45 ft., yielded 90 ft. oil. Later test in that formation, from 3,143--54 ft., gave 2,845 ft. oil-cut water in ¾ hour.

In the Hewitt section of the Jurassic (a limey sand formation), a 1-hour drill-stem from 3,347-56 ft., gave up 60 ft. clean oil. Gravity of oil not yet specified. Well now drilling below 4,025 ft.

Islay-Borradaile... Preliminary tests at the Driver Petroleums, Ltd., group's discovery well in the Islay-Borradaile area of central east Alberta gave up 3 to 4 bbl. of 20½°-gravity crude oil per hour and approximately 2,000,000 cu. ft. natural gas daily, through 7-in. casing. Production is coming from a 5-ft. perforated section in the Colony sand.

The well, Driver-Rex 1 Arrow, LSD 4, 16-50-4w4, lies 14 miles east-southeast of Vermilion. Top of the oil sand was found at 1,710 ft., and there are about 5 ft. of gas cap and 31 ft. of oil zone, company officials stated. String of 7-in. casing was landed at 1,780 ft. Current plans call for the running of 2½-in. tubing and installation of pump for further evaluation of the oil prospects at this well.

Medicine Hat... Bailey Selburn Oil & Gas Ltd., have completed a 2-mile natural gas extension success in the Medicine Hat region of southeastern Alberta. The new gasser is Baysel 15-2 Medicine Hat, LSD 15, 2-14-

5w4, 2 miles north of other gas wells in the area.

Hole was completed 1,130 ft. and rated a daily potential in excess of 4,000,000 cu. ft. The well encountered two separate porous zones in the Medicine Hat gas sand, one being from 1,076-96 ft., and the other from 1,114-23 ft.

EASTERN CANADA

Gaspe . . . In the Gaspe peninsula of Quebec, three out of five wells are drilling and some oil and gas indications have been encountered.

On the Bald Mountain anticline, Bald Mountain 2 is fishing at 5,141 ft. On the Galt Brook dome, Continental Deep Test 1 at 2,794 ft., encountered green paraffin base oil with a steady gas flow, and temporarily suspended drilling while preparing to drill in. Asphalt Base 1, testing a shallower formation on the same structure, is deepening after encountering a second gas shown at 900 ft.

Tar Point 1, on the Tar Point anticline, encountered a gas blow at 7,070 ft. and has bypassed the gas and is completing concrete cellar and will cement 5-in. casing before deepening.

Quebec Oil 2 is deepening below 4,918 ft. after correcting mechanical difficulties.

OKLAHOMA

Lincoln's Kendrick Area Has Good Record

Only one dry hole has been drilled in Lincoln County's outstanding Kendrick pool area since its opening. The Oswego reservoir has eleven producing oil wells, all excellent producers.

The latest new well in the rapidly expanding field is Sun Oil Co. 3 Inman, NE NW NE 9-15n-5e. The well flowed 438 bbl. of oil in 18 hours from perforations at 3,352-56 and 3,322-38 ft. in the Oswego lime. Sun has another well located and under way at 4 Inman, one location to the west. A stepout test is located to the north at Rex E. Moore et al 1 Melson, SW SE NW Section 3.

A north flank test in the pool has been completed at Foster Drilling Co. 6 Josephine, SW NW SW Section 3. That well flowed 3 bbl. of oil per hour from perforations at 3,276-96 ft. Foster has another well being perforated on the east side of the pool at 5 Josephine.

Northwest Kendrick . . . Development is expanding at Northwest Kendrick pool to the west.

Most production in this new pool is from the Prue sand. Floyd G. Hubbel completed 5 Gumaer, SW NE NE Section 7-15n-5e, in May for 264 bbl. of oil per day from the Oswego lime. T. C. Huddle is testing at 1 Tom Osborne in the NE SW NE Section 6. This new pool was opened last January.

Good Oil Flow Reported At Lincoln Discovery

Active Lincoln County appears to have a good discovery at E. L. Oliver 1 Overman, SW SW NE 28-14n-2e, 2½ miles southwest of the town of Wellston.

The well flowed 3 bbl. of oil per hour from a stray sand at 3,796-3,814 ft. Hogshooter top is at 3,565 ft. and the stray sand was found at 3,797 ft.

Tests Continue at Edmond Pool Area Strike

Walter Duncan is testing at an indicated Prue sand discovery 1¼ miles northeast of Edmond pool production in Logan County, central Oklahoma.

The 1 Jackson, NE NE SE 35-15n-4w, flowed at the rate of 89 bbl. of oil per day. Other gages taken earlier rated 112 and 91 bbl. per day. Total depth of the discovery is 7,220 ft. with the Prue sand topped at 6,249 ft. The Prue was perforated at 6,270-82 ft. and 6,254-64 ft.

New Bromide Sand Pool Assured McClain Area

Southern McClain County has a new Bromide sand discovery assured at Magnolia

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On test of the interval 8,311-21 ft. gas flowed in 5 minutes and oil in 40 minutes at the rate of 26 bbl. per hour. Recovery was 5,300 ft. of oil. A core is being taken below 8,340 ft.

The new pool opener is located 6 miles southwest of Purcell and 1 mile northwest of Southwest Wayne pool, a Deese producer.

ROCKY MOUNTAIN

NEBRASKA

Seventh West Sidney Gas Discovery Indicated

Ohio Oil Co. has tested a seventh gas discovery in the rapidly developing gas area west of the town of Sidney, Nebraska. Drill-stem test of the "D" sand interval 4,832-44 ft. flowed gas at the rate of 4 million cubic feet per day after 2 minutes of a 20-minute test. Core from 4,830-54 ft. included 13½ ft. of gas sand. A lower test 4,844-54 ft. flowed gas at the rate of 2,040,000 cu. ft. per day during 20-minute test, with a spray of water accompanying the flow. The wildcat is 1 Hill, SE NE NW 30-13n-50w.

Ohio has not confirmed previous discoveries, some of which gaged as high as 13 million cubic feet per day, but has not drilled a failure in the producing trend. Development has been retarded due to lack of outlet to regional markets, but negotiations for a pipeline system are under way at the present time and further development will follow establishment of an outlet for gas produced in the area. The area is apparently the second with significant gas reserves in the Nebraska portion of the Denver-Julesburg basin. Big Springs field in Deuel County, east of Sidney, has been a commercial producer for several years.

The Ohio discovery is one of five testing in Cheyenne and Kimball counties where the ratio of discoveries during 1953 has set one of the best records in the Rocky Mountain region.

Two Rank Wildcats Staked In Western Nebraska

Superior Oil Co. has made locations for rank wildcat tests in Box Butte and in Hays counties, both of them in areas which have been of some sporadic interest during the current drilling program in the western part of the state. The company will drill 18-5 Johnston in SW SW SW 2-25n-50w, Box Butte County, about 15 miles south of a 1952 completion by Superior which made gas in noncommercial quantities. The wildcat is of interest as another test of the Chadron arch area.

In Hays County Superior located for 88-1 Schneider, SE SE SE 1-5n-31w, with the well scheduled to go to Pennsylvanian.

WYOMING

Manderson Area Well Shows for Good Potential

L. J. Peterson, independent, is testing a 1¾-mile extension of production in the Manderson area of Big Horn County. The well, 1 Wycol-Government, C SW NE 2-49n-92w, was reported flowing at the rate of 65 BOPH through 1-in. choke and 30 BOPH through ⅜-in. choke on short tests of a 31-ft. section of Phosphoria which was topped at 5,769 ft. The formation was not acidized prior to tests, and the operator will continue flow tests without treatment.

Fremont County Wildcat Is Apparent Tensleep Discovery

Sinclair Oil & Gas Co. and Stanolind Oil & Gas Co. swabbed 350 bbl. of oil in 24 hours from Tensleep at 1 North Sand Draw Unit, SW SE SW 21-33n-95w, Fremont County, for an apparent commercial discovery. The well was plugged back to 10,818 ft. from a total depth of 11,500 ft. Shows were logged in Tensleep during drilling, with the formation reported somewhat hard and tight. Casing was landed in the well at 10,752 ft. and production is from perforations in the lower 18 ft. and from open hole. The wildcat has had what is considered to be the most thorough testing and core program in Wyoming oil history.

New Green River Basin Exploration Scheduled

Continental Oil Co. is moving in materials for a wildcat 2 miles east of shut-in gas production in the Big Piney area of Sublette County. The well is 1 Government-Northern Pump, C NE NE 32-30n-113w, and will be a test to Mesaverde at about 5,500 ft. Previous gas production in this area is from the shallow Almy and Wasatch sands. The Mesaverde attracted interest as a producing formation in the Green River basin with the discovery of oil at Middle Mountain and gas in the Trail Unit areas of Sweetwater County about a year ago. The formation is not a major producer north of San Juan basin, although recent discoveries have been made in Mesaverde prospects in Utah and production has been known from the formation in Wyoming in several areas for some time.

Mountain Fuel Supply Co. has also entered the exploratory program on the west side of the Green River basin and is making location for a wildcat on the Deadline Ridge structure, previously undrilled, about 10 miles west of LaBarge field.

NORTH DAKOTA

Stark County Deep Test Planned

Plymouth Oil Co. has made location for 1 Fischer, C NW NE 11-137n-98w, Stark County, a scheduled 10,500-ft. or Ordovician test. The well is the latest in a series of tests which have been drilled in the deep North Dakota portion of the Williston basin during the past year, and is about 18 miles southeast of Amerada Petroleum's 1 May, C NW NE 9-139n-100w, now drilling below 9,040 ft. in the Fryburg area of Billings County. The Plymouth wildcat is on a 35,000-acre seismograph prospect owned jointly by this operator and by Hiawatha Oil & Gas Co.

MONTANA

Daniels County Show Reported

Carter Oil Co. recovered 15 ft. of bleeding limestone core from 1 Danielson, C NE SW 12-36n-47e, in the Whiskey Butte area of Daniels County, Montana. Core was from 5,826-74 ft. No tops have been released by the operator but at this depth the well is believed to be in Charles. Test of the zone 5,858

ft. recovered 100 ft. of gas and 140 ft. of salty water, and oil and gas-cut mud in 3 hours.

Deep Williston Basin Discovery Still Testing

Sun Oil Co. and Phillips Petroleum Co. are continuing tests at 1 Dynneson, C SW NE 32-24n-58e, in the Bronson area of Richland County. The well was reperforated in the zone 12,585-605 ft. and swabbed oil, gas, mud and salt water on initial swabbing. After being shut in for 12 hours the well flowed clean oil for ¾ of an hour, and oil cut with salt water for 4 hours. A later 6-hour flow was 31.6 bbl. of oil. This same zone flowed 206 bbl. of oil in 24 hours before perforations clogged with mud. The well is an important deep discovery in one of the least explored areas of the eastern Montana portion of the basin.

COLORADO

Southern Weld County Lyons Show Fails to Produce

Test of the Lyons (Permian) sand at William R. Whittaker's 1 Klauser, C NE SW 34-1n-72w, southern Weld County, recovered very slightly oil and gas-cut water. The wildcat had attracted wide attention a week ago as a possible second Lyons discovery in the Denver-Julesburg basin. Staining was found in a 30-ft. section of core through good sand.

The wildcat has been plugged with total depth at 8,413 ft. following plug back to test Morrison sands.

The Whittaker wildcat is one of several which have been drilled following the discovery of the first pre-Cretaceous oil in the Denver-Julesburg basin by Sherrod & Apperson in the Keota area, 50 miles north of the Whittaker wildcat.

MICHIGAN

From June 1 until June 7 it appeared that William B. Darke had a new Traverse oil discovery well in Evergreen Township, Montcalm County, at the 1 Webster, SE NW SW 22-10n-6w. But well was acidized late in the period and according to last report, well was swabbing about 4 or 5 bbl. of water to 1 bbl. of oil. However, there was reported to be a good head of gas still showing and well was being equipped for pumping to make a more complete evaluation of the well's potential.

Alpena Traverse was topped at 2,779 ft. and oil pays were drilled at 2,803-08 ft. and at 2,810-12 ft. Well filled at the rate of about 1 bbl. of oil an hour natural on initial tests and after 5-in. casing had been run on a packer and perforated bottom joint hole filled about 1,000-ft. with free oil. The water did not start to show until following the 500-gal. acid treatment.

The Darke wildcat is located on a 3,000-acre lease block and Traverse zone showing oil was checked in structurally higher than all surrounding control points. Wildcat is located about 8 miles northwest of Bloomer Traverse oil pool. Montcalm County—one of the better basinward Traverse fields, and is about 7 miles southeast of Stanton Traverse field, Montcalm County, one of more recent (1951), but small Michigan pools. It is expected that regardless of the eventual outcome of the Darke 1 Webster, SE NW SW 22-10n-6w, that additional drilling will follow in the area.

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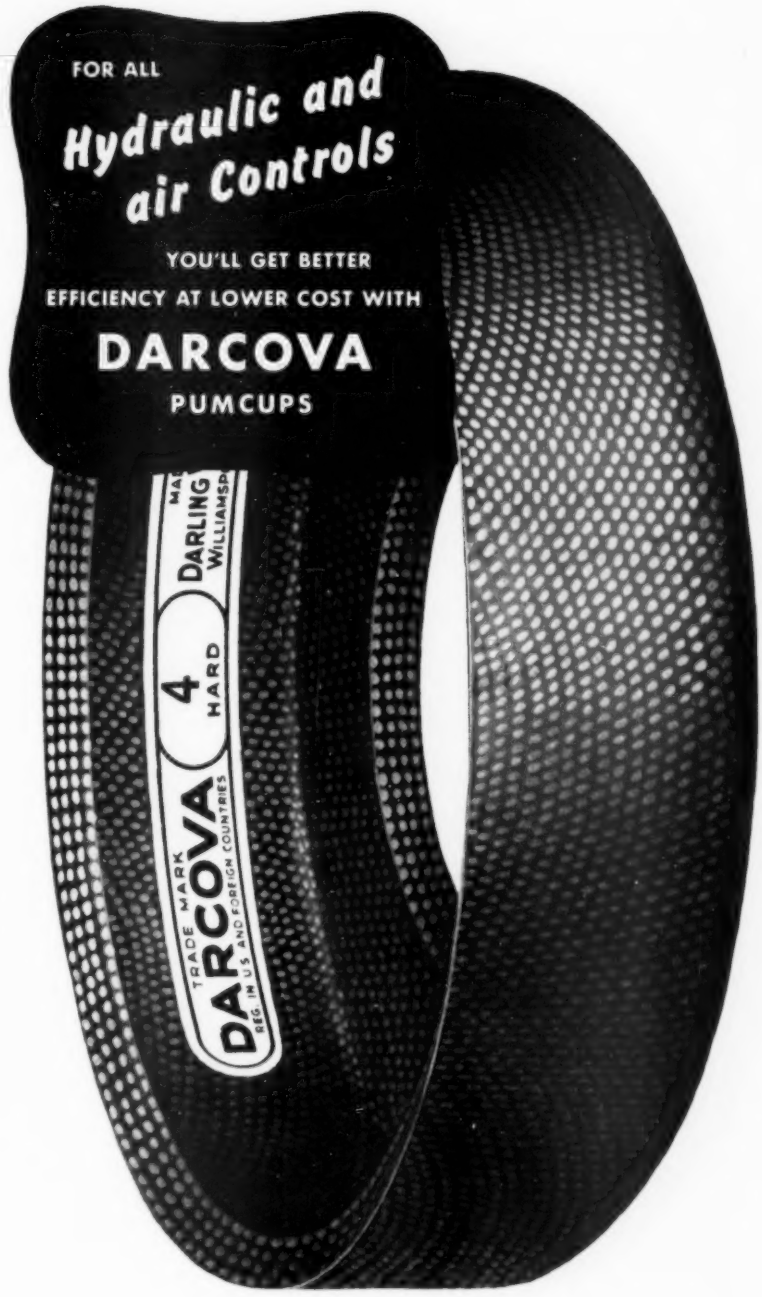

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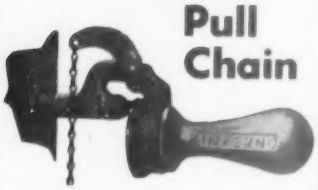
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of oil an hour after acid treatment with 1,000 gal. in the Traverse, the W. D. Gannett (actually owned by Ford Oil Co. & Basin Oil Co.) 1 Spicer, SW SE SW 5-4s-13w, Porter Township, Van Buren County, appeared to be the best oilwell completion in Lawton Traverse pool and at the same time it appeared to have extended the field about 1 mile or more to the north. Traverse lime was logged at 1,047 ft. and well was drilled to 1,052 ft., total depth, where hole filled 200 ft. with free oil natural in 40 hours. A small water-cut was reported showing.

CALIFORNIA

Standard Completing Deeper Pay Discovery at Lost Hills

After drilling to 8,200 ft. to test deeper possibilities, Standard Oil Co. of California has plugged back its 16 "Well" in the Lost Hills field, Kern County, for completion in about 30 ft. of Carneros sand topped at 6,022 ft. If successful, the well will add this deeper Miocene pay to the field's regular 1,500-2,000-ft. Pliocene pay.

The potential discovery is in NW SW 29-26s-21e, approximately in the center of the 7-mile long anticlinal structure. When a formation test was made last April at 6,034-6,138 ft., 1,250 ft. of 33°-gravity crude was recovered after the tester had been open 1¼ hours. No free water was recovered.

New Fault-Block Pool Added at Richfield

Based on the well's initial performance, an extensioner on the south flank of the Richfield field, Orange County, has discovered a new fault-block pool. The discovery was completed flowing and pumping about 250 bbl. of 19.7°-gravity crude daily whereas nearby wells were much smaller producers.

The new pool opener was Drilling & Exploration, Inc., 1 Drilexco-State-Stern in NE SE 32-3s-9w. It was drilled to 4,985 ft. where a 7-in. combination string was cemented through perforations at 4,050 ft.

Tejon Flats Wildcat Testing

J. V. Dougherty & Associates halted drilling at 8,789 ft. in its Tejon Flats wildcat and was preparing to test oil shows encountered in drilling to that depth. The wildcat, 65-14 "Well," is in NK SE 14-11n-19w, 1¼ mile northwest of the Miocene sand discovery made by Union Oil Co. last March at 6,912-19 ft.

In Section 33, Reserve Oil & Gas Co. 77-33 "Well" yielded 166 ft. of gas-cut mud with some oil after a 1½-hour formation test at 6,947-7,010 ft. Following the test coring was continued.

Second Producer in Ventura D-8 Zone

Tide Water Associated Oil Co. completed 173 Lloyd in the eastern part of Ventura Avenue field as the second producer in the D-8 zone discovered by Shell Oil Co. last February. The Lloyd well, in 27-3n-23w, flowed 925 bbl. of oil daily through perforations at 11,795-11,990 and 12,030-52 ft. The discovery well, Shell 417 Taylor in Section 28, flowed 1,078 bbl. of oil daily through

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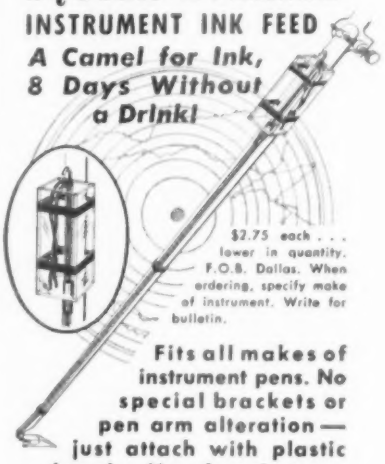
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a 12/64-in. bean from perforations at 9,799-10,841 ft. and 11,044-11,394 ft. Tubing pressure in both wells was about 3,000 psi.

KENTUCKY

EASTERN KENTUCKY

Along the Estill-Powell County line and located in Furnace gas field Raydure et al, have a gas well at their 1 Omar Shouse in 21-P-68, Estill County. St. Peter sand was topped at 2,602 ft. with gas occuring in the interval from 2,638 to 2,642 ft. total depth. At that depth was gaged 1,270,000 ft. daily. Well is currently testing.

On Harless Creek in Pike County, Kentucky and in Big Sandy gas field Columbian Fuel Corp. have deepened No. 5 Semet Solvay Co. from an old total depth of 2,097 ft. to 2,843 ft. total depth. In the Big lime gas gaged 1,082,000 cu. ft. daily from 2,803 to 2,825 ft. Well was acidized with 500 gal. and an 18-hour pressure test showed 695 psi.

ILLINOIS

One Discovery, Four Extensions in May

May operations, according to the Illinois State Geological Survey, accounted for one new oil pool and four extensions to existing fields. The discovery was East Eldorado pool in Saline County, located on the southern edge of the Illinois basin.

Extension wells were drilled in South Oskaloosa, Clay County; Goldengate Consolidated and Clay City Consolidated in Wayne County, and Iron in White County.

Weekly completions in May averaged 35, compared with 28 per week through April.

LOUISIANA

SOUTH LOUISIANA

Northwest Branch Field Spreads Southwestward

Another substantial extension of the productive area of the Sunray Oil Corp.'s Northwest Branch field, in Acadia Parish, is indicated by successful tests already made in a step-out well a half mile southeast of the present most easterly of the three producers which have been completed in the field.

Commercial production virtually is assured in the step-out well not only in the Hackberry sand zones encountered in previous wells but also in approximately 16 ft. of new sand in the lower Nodosaria Blandei section. In all, four zones have given indication of production.

The extension well, 1 Ciemance Fontenot, in testing the new lower sand, opposite which casing was perforated at 11,174-82 ft., flowed at the rate of 2,350,000 cu. ft. of gas with 252 bbl. of distillate per day through chokes under tubing pressure of 4,790 psi.

Zones previously tested included the field's upper Nodosaria Blandei sand, opposite which casing was perforated at 11,125-29 ft., and the field's higher "Ns." sand, perforated at 10,810-14 ft. In the first, the well flowed at the rate of 2,350,000 cu. ft. of gas with 268 bbl. of distillate daily under tubing pressure of 5,700 psi. In the second the flow was at the rate of 2,250,000 cu. ft. of gas with 131 bbl. of distillate daily under tubing pressure of 2,750 psi. Both tests were through 16/64-in. chokes. Productive potentialities of shallower indicated pay sands are now being tested.

All previously known sands have run as much as 60 ft. higher in this well than in the nearest well, a half mile to the northwest.

Sunray opened the field late in 1951 at its 1 Fred Loewer, completed from casing perforations in sand at 11,178-185 ft. Its second well, 1 Cyphien Fontenot, located a mile east and until now the most easterly well, produces from the same sand with casing perforated at 11,196-206 ft. The third well, 1 Daley, recently completed, and located about a half mile north of the mid point between the above two wells, produces from the shallower "Ns" sand, perforated at 10,843-48 ft. The latter sand was potentially productive in the first two wells but was passed up for the deeper sand. Another test, 1 Bruner, located a mile southwest of the discovery well, failed to find commercial production.

In its development program, Sunray is attempting to evaluate a 7,000-acre block, including an entire section of land immediately east of the new southeast step-out well.

NORTH LOUISIANA

Two New Fields Opened In Area During May

North Louisiana reported a good month from the exploratory success standpoint. Billups Bros., Vasser & Brown opened Buck Bayou field in Concordia Parish for a new Wilcox sand pool 3¼ miles east of Ross Bayou field. The well flowed at the rate of 163 bbl. of oil per day. An east offset has begun in the new producing area.

The other new find was in Rapides Parish

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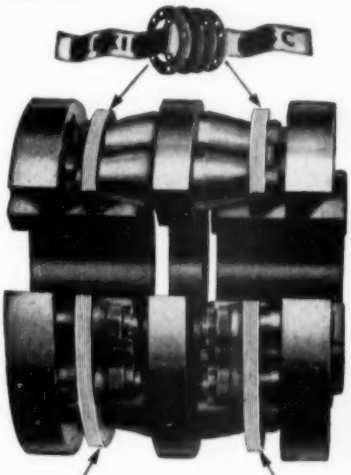

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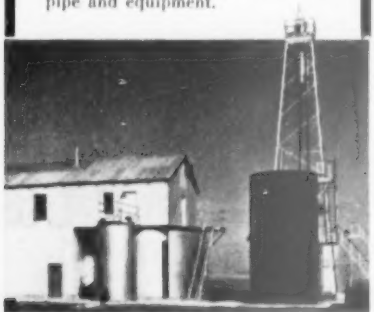

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at Mid-States Oil Corp. and J. R. Butler 1 Heflands, Inc. This discovery also produces from the Wilcox.

Blackburn Is New Pool In Claiborne

Claiborne Parish has a new pool at Pan Am Southern Corp.'s 1 Woods, NW SE 30-22n-8w. The well flowed 982 M.c.f. of gas and 50 bbl. of 58.6°-gravity condensate per day, opening Blackburn field. The well produces from perforations at 8,616-27 ft. in the Bodcaw sand of the Cotton Valley formation.

MISSISSIPPI

Smackover Discovery Completion Delayed

The problem of producing gas containing 73 per cent non-inflammable carbon dioxide and 5 per cent poisonous and corrosive hydrogen sulfide is delaying the successful completion of what promised to become Mississippi's first commercial Smackover well.

The prospective discovery producer, Carter Oil Co. 1 Brown, located in the C SE NW 31-11n-4e, southeast of Loring, in northern Madison County, has been reported as "temporarily abandoned," and the rig has been released.

In production tests of the Smackover section, with hole open at 12,130-87 ft., the well flowed at the rate of 4,589,000 cu. ft. of gas with 223 bbl. of condensate per day through 5/8-in. top and 3/4-in. bottom chokes, gaging 1,000 psi. pressure on the tubing.

ARKANSAS

Travis Peak Production Opened at Irma In May

May's only discovery in Arkansas was Ranney Exploration Co.'s Travis Peak strike in Irma field, Nevada County. The 1 J. D. Reynolds, C SW SE SW 31-13s-20w, produces from perforations at 3,016-22 ft. Berry Asphalt is drilling a confirmation try at 3 Grove Land & Timber Co., NW NW NE 6-14s-20w.

North Lisbon to Get Fast Development

Leonard W. Phillips plans a rapid field development program in the North Lisbon area of Union County. The company has Smackover lime production assured at 1 Clemmie M. Bishop, C NE SE 25-16s-17w. The well was swabbed and flowed by heads at the estimated rate of 11 bbl. of oil per hour. Phillips is rigging up ½ mile west of the discovery at 1 McDonald, C NE SW 25-16s-17w. The operator has another well staked between the discovery well and the 1 McDonald at 1 Hogg, C NW SE 25-16s-17w.

Washington Gas Area Expands

A gas-well drilling program that began last December in northwestern Arkansas' Washington County has resulted in two new gas wells and three dry holes in the West Fork and Greenland areas.

The discovery well in the West Fork area was Arkansas Western Gas Co.'s 1 Threlkeld, Sr., Section 5-14n-30w. The well was completed last January from the Sylamore through open hole at 566-586 ft. Calculated open flow was 1,500 M.c.f. of dry gas per day. Just northeast of the discovery well the same operator finaled 1 George Latham, Section 33-15n-30w, for a calculated open flow of 1,500 M.c.f. of gas per day from the Sylamore at 614-31 ft. The wells are supplying the town of West Fork at present.

WILDCAT COMPLETIONS

SOUTHWEST TEXAS

Aransas County: William H. Hunt Trust Est. 1 McCampbell, James Orick Sur., A-167. IP 194 BOPD, 10/64-in., 42.1°, Frio 6,746-50 ft. (casing perforations). TD 9,027 ft. (New field-Puerto Bay.)

Caldwell County: Rock Hill Oil Co. at al 1 McWhorter, S. Hayslett Sur. 160. Dry. Td 5,316 ft.

Duval County: Louis Kelsey and Marshall Boykin 1 Clara Driscoll Estate, Sweden Farm Lots Subd. Dry. TD 2,365 ft.

Frio County: Howeth & Mason 1 Frieda Kleid Schuchardt, Mary Pigford Sur. 238, A-717. Dry. TD 5,415 ft.

Gonzales County: James Doughty 1 Steve Hrncinik, Gonzales County School Land Sur. Dry. TD 1,450 ft.

James Doughty 1 Robinson, James Gibson Sur. Dry. TD 2,503 ft.

Jim Hogg County: Miller & Pierce 1 Gutierrez, Survey 164. Dry. TD 3,201 ft.

Jim Wells County: Max Pray 1 Willie Banker, Jr., J. Poitevent Sur., A-357. Dry. TD 5,487 ft.

McMullen County: Kirkwood & Morgan 1 Nueces, Theodore Roziene Sur. 330, A-804. Dry. TD 7,051 ft.

San Patricio County: Forest Oil Corp. 1-B Welder, P. G. Young Subd. Dry. TD 7,415 ft.

Starr County: L. M. Lockhart 1 Brock, Porcion 87. IP 820 M.c.f. daily, open flow, casing perforations 2,427-53 ft. TD 2,904 ft. (New field.)

L. M. Lockhart 1 Lockhart & Co., Survey 934. Dry. TD 2,493 ft.

Owen & Moss 1 Fee, Porcion 83. Dry. TD 1,810 ft.

Webb County: Magnolia Petroleum Co. 1 Duval Ranch, Section 100-B, Duval County School Land League 100, A-1184. Dry. TD 3,610 ft.

Wilson County: H. H. Howell 3 Weinert, V. Bennett Sur. 25. Junked hole. TD 3,673 ft.

J. C. McCabe et al 2 Fuller, M. Tarin Sur. 48, A-331. Dry. TD 1,748 ft.

Oil Corp. 1 Sanders, Francisco Herrera Sur., A-15. Dry. TD 2,642 ft.

Producers Corp. of Nevada 2 McDaniel, Charles Patton Sur. 4. Dry. TD 2,761 ft.

TEXAS GULF COAST

Bee County: Wymore Oil Co. 1 Ellis, J. Hood Sur., A-181. Dry. TD 3,410 ft.

Brazoria County: Jack W. Frazier 1 Lawrence et al., HT&B Sur., A-283. Dry. TD 7,821 ft.

Calhoun County: Lonnie Glasscock 1 Stofer-Eiband, Miguel Cortez Sur., A-9. Dry. TD 9,490 ft.

Chambers County: H. R. Smith 1 Morgan, James White Sur., A-300. Dry. TD 8,307 ft.

Galveston County: Humble Oil & Refining Co. 1 S. H. Oil & Royalty Co., Leroy Geudry Sur., A-25. Dry. TD 10,010 ft.

Harris County: Lee Brothers Drilling Co. 1

WILDCAT COMPLETIONS

Drilling District 18, HT&B Sur. 5, A-385. IP 1,940 M.c.f. daily, open flow, casing perforations 4,212-21 ft. TD 5,034 ft.

Jackson County: Sun Oil Co. 1 Trumble unit, I&GN Sur. Junked hole. TD 10,000 ft.

Jefferson County: D. D. Feldman Oil & Gas Co. 1 Blieden, W. P. H. McFaddin Sur., A-513. Dry. TD 10,632 ft.

Michel T. Halbouty 1 Weed, J. Douthit Sur. IP 118.21 BOPD, 3/8-in., 30.5°, lower Frio 4,851-58 ft. (casing perforations). TD 5,088 ft. (New pay in Spindletop field.)

Lavaca County: D. D. Harrington 1 Clark heirs, Caroline Browa Sur., A-81. Dry. TD 7,011 ft.

Liberty County Sohio Petroleum Co. 1 Grogan, Ed B. Jackson Sur., A-297. IP 28,750 M.c.f. daily, open flow, casing perforations 6,057-59 ft. TD 7,512 ft. (New field 7,200 ft. northwest of Quinn field.)

Live Oak County: Atlantic Refining Co. 1 Bodden, J. Poitevent Sur. 19, A-386. IP 8,600 M.c.f. daily, open flow, with 28 BC per M.M.c.f., 59°, upper Wilcox 7,930-50 ft (casing perforations). TD 8,070 ft. (New field.)

F. B. Cochran, Jr., 1 Stephens, Simmons Subd., Sur. 74. IP 113,000 M.c.f. daily open flow, with 10 BC per M.M.c.f., Queen City 5,057-63 ft. (casing perforations). TD 5,065 ft. (Extends, and new pay in, South White Creek field.)

Pontiac Refining Corp. 1 Little, J. Ward Sur. 330, A-525. Dry. TD 4,992 ft.

Polk County: Carlton D. Speed, Jr., et al., 3 Quinn-Carter, A. Morales Sur., A-52. Dry. TD 5,352 ft.

Wharton County: T. J. Ahren 1 Aurelius, J. B. Morford Sur. 4, A-519. Dry. TD 6,504 ft.

EAST TEXAS

Anderson County: E. L. Howard 1 L. H. Coleman, John A. Box Sur., A-10. Dry. TD 5,780 ft., elev. 287 ft., Austin chalk 5,221 ft.

Bowie County: Murray Petroleum Co. and J. W. White 1 Gertrude Gregory, Josiah W. Fort Sur., A-218. Dry. TD 4,111 ft., Massive anhydrite 3,655 ft.

Freestone County: Coffield & Guthrie 1 Oliver Bounds, Wm. Ritchie Sur. Dry. TD 1,089 ft.

Harrison County: Humble Oil & Refining Co. 1-B T. J. Taylor, R. O. Watkins Sur., A-752. Dry. TD 6,765 ft.

Henderson County, Wm. Keese Sur., 3 mi. NW Cayuga field. C. E. Hyde, P. N. Wiggins and Pure Oil Co. 1 Creslenn Ranch Co. IP 2,000,000 cu. ft., open flow, Pettit 8,000-08, 8,017-23, 8,034-88 ft., plus 100 bbl. distillate; IP 10,300,000 cu. ft., open flow, Rodessa 7,426-36, 7,466-76, 7,487-93 ft., plus approximately 680 bbl. distillate. TD 8,563 ft.

Hill County: Fason & Lee Co. 1 Mrs. T. F. McGuffey, D. Phillips Sur. Dry. TD 1,252 ft.

Fason & Lee 1 Mrs. C. R. Menefee, Henry Lee Sur. TD 1,338 ft.

Holland and Martin 1 Andrew Mayse, R. S. Patton Sur. Dry. TD 1,326 ft.

Killiam-Hodde 1 P. E. Adkins, James Yancy Sur. Dry. TD 977 ft.

Navarro County: Humble Oil & Refining Co. 1 Sarah B. Tramel, A. C. Kyser Sur. Dry. TD 6,384 ft.

Titus County: Stephens and Moore 1 Orrill and Fulbright, Thomas Chatham Sur., A-105. Dry. TD 4,764 ft., Georgetown 3,675 ft.

TEXAS PANHANDLE

Hemphill County: C. C. Freeman 1 Urschell, 65-1-G&M, 2 mi. W Glazier. Dry. TD 4,106 ft., elev. 2,643 ft., dolomite 3,850 ft.

Lipscomb County: C. C. Freeman 1 Wayne Cleveland, 68-43-H&TC, 11 mi. N Canadian. Dry. TD 4,015 ft., elev. 2,707 ft., dolomite 2,870 ft.

WEST CENTRAL TEXAS

Brown County: Chas. Rupe Drilling Co. 1 Byler, Sec. 43, T&NO. IPP 16 BOPD, sand pay 1,264 ft. TD 1,325 ft.

Coleman County: Louis Franklin 1 George Stewardson, Sec. 95, ETRR. Dry. TD 1,705 ft.

Hack Drilling Co. 1 D. M. Hankins, Sec. 3, ETRR. Dry. TD 4,036 ft.

H & L Exploration Co. 1 Tom Connelly, W. H. Black Sur. 278. Dry. TD 1,890 ft.

A. R. Venuto 1 Cresswell, 96-2-GH&H. Dry. TD 3,608 ft.

Hamilton County: H & L Exploration 1 W. Siems, Hamilton CSL Sur. 10. Dry. TD 4,080 ft.

Haskell County: Tri-M Production Co. 1 Howard, B. F. Wood Sur. 37. Dry. TD 5,620 ft., elev. 1,441 ft., Caddo 4,988 ft., Mississippian 5,200 ft.

E. K. & E. M. Burt 1 Leck, 17-1-BBB&C. Dry. TD 2,860 ft.

Nolan County: Texas Pacific Coal & Oil Co. 1 Mrs. S. E. Herndon, James Vaughn Sur. 294. Dry. TD 6,174 ft.

Ultra Oil Co. 1 TXL, 19-Z-T&P. Dry. TD 4,702 ft.

Shackelford County: Don L. Choate 1 Burton, Sec. 73, University Lands. Dry. TD 2,210 ft.

Taylor County: Gore Drilling Co. 1 Forrester Heirs, 46-19-T&P. IPP 47 BOPD, 42°, Ellenburger 5,606-21 ft. TD 5,641 ft.

NORTH TEXAS

Archer County: Archer Drilling & Production Co. 2 W. W. Ray, Blk. 132, John Harris Subd. IPP 177.5 BOPD, 39°, pay 1,295 ft. TD 1,298 ft.

R. W. Darden 1-B Richardson Trust, Blk. 24, J. Scott Sur., A-374 Dry. TD 1,301 ft.

Clay County: Ralph O. Harvey 1 J. Hoff, Blk. 2, Clark & Plumb. Dry. TD 4,600 ft.

Grayson County: L. O. McMillan 1 H. A. Blanton, T. T. Peck Sur., A-987. Dry. TD 6,807 ft., elev. 724 ft., Oil Creek 6,700 ft.

J. L. Shaw 1 A. C. Hackworth, J. Seymour Sur., A-1066. Dry. TD 7,012 ft.

C. J. Simpson Drilling Co. 1 C. L. Noland, J. W. Younger Sur., A-1395. Dry. TD 6,333 ft.

Jack County: Fain & McGaha 1 Mary Hoefle, O. H. P. Davis Sur., A-186. Dry. TD 4,010 ft.

Midland Oil Corp. 1 Midland-Morris, H. Martin Sur., A-383. IPP 15 BOPD, pay sand 4,416 ft. TD 5,511 ft.

W. T. Waggoner Estate 1 J. W. Sampley, R. Parker Sur., A-461. Dry. TD 4,010 ft.

Knox County: Sojourner Drilling Co. 1 Vaughn, 56-2-D&W. Dry. TD 5,880 ft.

Wichita County: G & R Drilling Co. 1 Waggoner, 26-5-H&TC. Dry. TD 2,006 ft.

K I. B Drilling Corp. 1 G. N. Gwinn, Sec. 15, Tarrant CSL. IPP 32 BOPD, 40°, pay 3,230 ft. TD 3,240 ft.

Moncrief-Eddleman Oil Co. 2 Neva R. Temple, Blk. 8, Palo Pinto CSL. IPP 53 BOPD, 38°, pay 692 ft. TD 701 ft.

Wilbarger County: I. Dee Campbell 1-F Waggoner, 57-4-H&TC. Dry. TD 2,011 ft.

Young County: G & R Drilling Co. 1 Dee

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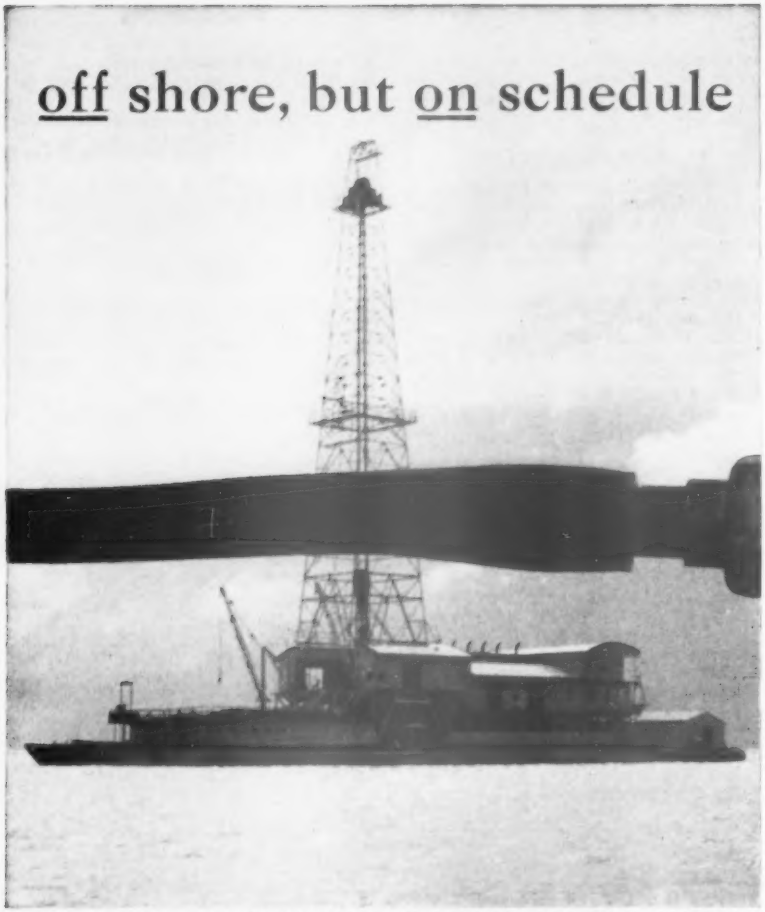

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WILDCAT COMPLETIONS

Wilburn, TE&L Sur. 2446, A-1124. Dry. TD 1,285 ft.

Horning and Harris 1-B Spear, W. Stoneman Sur., A-250. Dry. TD 790 ft.

Megargel Drilling Co. 1 W. H. Lindsey, J. N. Smith Sur., A-1945. IPP 86 BOPD, pay 1,882 ft., TD 2,193 ft.

W. T. Waggoner Estate 1 Berry Bros., R. E. Byrd Sur., A-47. Dry. TD 2,700 ft.

WEST TEXAS

Andrews County: Makin Oil Co. 1 Crews, 9-A34-PSL. Dry. TD 6,140 ft.

Borden County: C. C. Green, Jr. and Oceanic Oil Co. 1 Sue Allice Slaughter, 24-33-T3N-T&P. Dry. TD 8,373 ft., elev. 2,653 ft., reef 8,336 ft.

Coke County: Stanolind Oil & Gas Co. 2 Norton Properties, L. N. Taylor Sur. 5. Dry. TD 5,775 ft., elev. 1,934 ft. Ellenburger 5,543 ft.

Crockett County: Kimberlin 1 D. A. Carter, 3-A-MK&T. Dry. TD 2,283 ft.

A. R. McElreath 1-3 University, 3-29-University. Dry. TD 1,825 ft.

Kent County: C. C. Green, Jr. and L. T. Lohman 1 Davis, 57-G-W&NW. Dry. TD 7,377 ft., elev. 2,179 ft., Mississippian 7,340 ft.

Lynn County: Magnolia Petroleum Co. 1 J. A. Timmons, 142-12-EL&RR. IP 219 BOPD, 16/64-in. choke, reef 9,835-65, 9,806-20 ft. TD 9,914 ft. Second well and offset location to discovery.

Pecos County: Phillips Petroleum Co. 1-D Puckett, 26-101-TCRR. IP 15,850 M.f.g. in 8 hours, 1-in. choke, TP 2,078 psi., Ellenburger 13,698 ft., TD 14,327 ft. Extension to Glenna gas-distillate discovery.

Reeves County: Buffalo Oil Co. 1 Raymond A. Porter, 3-2-H&GN. Dry. TD 3,951 ft.

Gulf Oil Corp. and Jack Frost 1 P. C. Northrup, 33-50-T&P. Dry. TD 16,696 ft., elev. 2,830 ft., Delaware lime 6,172 ft., Bone Springs 7,780 ft., Wolfcamp 9,880 ft.

Runnels County: Henson Drilling Co. 1 Enoch Johnson, Sec. 177, HT&B. IP 191 BOPD, 32/64-in., 40°, Morris sand 3,604-10 ft. TD 4,310 ft.

Schleicher County: B. L. McFarland, Inc., and Texas Crude Oil Co. 1-45 Perry Mittel, 45-LL-TCRR. Dry. TD 7,209 ft., elev. 2,452 ft., reef 6,815 ft., Ellenburger 7,050 ft.

Reoco Oil Co. 1 Thad A. Thompson, Jr., 43-A-HE&WT. Dry. TD 255 ft.

Sutton County: O. C. Proffitt 1 J. P. Reily, 24-A-GWT&P. Dry. TD 285 ft.

Tom Green County: Cosden Petroleum Corp. 2 J. R. Mims, 79-6-H&TC. Dry. TD 5,283 ft., elev. 2,310 ft., Wolfcamp 2,920 ft., Cisco 4,495 ft.

John Odstricil 2 E. D. Jones, J. C. Helde Sur. 258. Dry. TD 300 ft.

Republic Natural Gas Co. 1 Johnson, 34-25-H&TC. Dry. TD 6,270 ft., elev. 2,148 ft., Strawn 5,283 ft., Ellenburger 5,758 ft.

Yoakum County: Marlewe Oil Co. 1 Moore, 486-D-J. H. Gibson Sur. IPP 23 BOPD, 31°, pay 5,390 ft. TD 7,502 ft.

J. I. O'Neill, Jr. 1 Mary F. Lackey, 501-D-J. H. Gibson Sur. Dry. TD 8,260 ft.

ILLINOIS

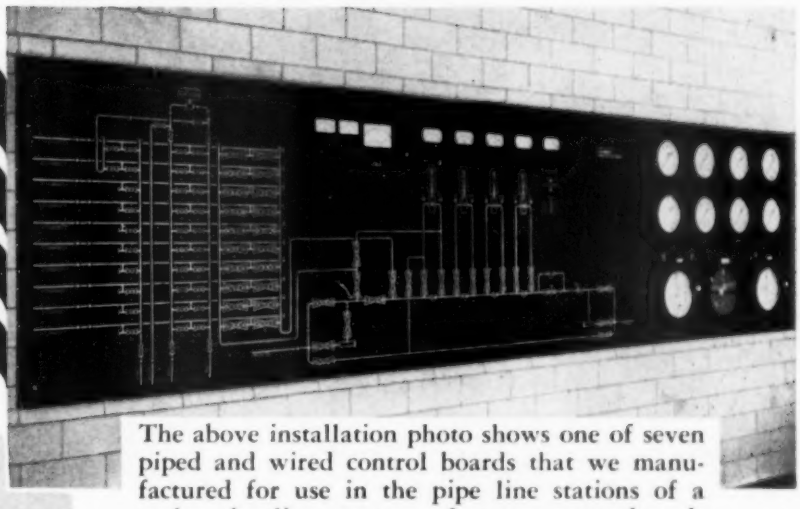
Christian County: E. L. Wirth 1 Millhon, SW NE NW 17-13n-1e. Dry. TD 2,419 ft.

Clay County: Fred Bippus 1 Brewer, NE NW NW 14-2n-6e. Dry. TD 3,185 ft.

Lawrence County: Henry Gwaltney 1 Lackey, NW NW SE 36-5n-11w. Dry. TD 1,676 ft.

Marion County: H. C. Sanders 1 Kell, NE NW NE 11-1n-2e. Dry. TD 3,842 ft.

CUSTOM-BUILT CONTROL BOARDS For PIPE LINE STATIONS



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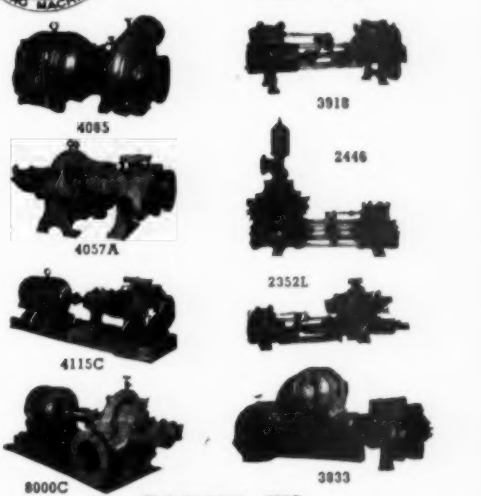

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AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

WILDCAT COMPLETIONS

Wayne County: W. D. Griffin 1 J. B. Smith, SW NW NW 27-1s-7e. Dry. TD 3,277 ft.

INDIANA

Daviess County: Marion Chapman 2 Graber, SW SE SE 33-3n-5w. Dry. TD 725 ft. C. Seneff 1 City of Washington, Location 131-3n-7w. Dry. TD 1,291 ft.

Dubois County: R. L. Tilton 1 Steinecker, NE SE NW 6-3s-5w. Dry. TD 1,138 ft.

Gibson County: Ralph Halbert 1 Lowe and Reynolds, NW NE SE 7-4s-11w. Dry. TD 2,631 ft.

Sullivan County: B. M. Heath 1 Temple Coal, SE NW NW 30-8n-8w. Dry. TD 455 ft.

KENTUCKY

Daviess County: L. E. Owens 1 J. J. Thomas, NW NW NE 3-O-31. Dry. TD 1,526 ft.

Henderson County: Slagter Production Co. 1 Pruitt, NW NE NW 21-P-24. Dry. TD 2,345 ft.

McLean County: J. C. Miller and Ashland Oil & Refining Co. 1 Dane, SE SW SE 4-I-27. Dry. TD 2,730 ft.

MICHIGAN

Jackson County: Allied Investments, Inc. 1 McComsey, NE SW SE 7-3s-2e. Dry. TD 1,744 ft. in Traverse.

St. Clair County: Panhandle Eastern Pipeline Co. 1 Coleman, C NW 3-3n-15e. Dry. TD 2,700 ft. in Niagaran.

Van Buren County: G. W. Miller & L. W. Page 1 Imig, SW NW NW 3-1s-14w. Dry. TD 1,307 ft. in Traverse.

Van Buren County: Orville Palmer 1 Rosenvear, SW SE SW 10-1s-15w. Traverse 1,168 ft., IP 18 bbl., TD 1,171 ft. (Extension to west of Bloomingdale pool.)

ALABAMA

Geneva County: Harry Harris 1 Youngblood, C NW NW 17-2n-25e. Dry. TD 3,829 ft. Elev. 207 ft., Eutaw 2,666 ft., marine Tuscaloosa 3,090 ft., lower Tuscaloosa 3,288 ft., Lower Cretaceous 3,457 ft.

MISSISSIPPI

Adams County: Humble Oil & Refining Co. 1 E. L. Hamilton est., 8-4n-3w. IPP 34 BOPD, 35.6°, Wilcox 6,503-06 ft. (casing perforations). TD 7,009 ft. Elev. 64 ft., Vicksburg 2,442 ft., Sparta 3,547 ft., Wilcox 4,695 ft., base Baker shale 6,482 ft. (New field-Shieldsboro.)

Franklin County: Durbin Bond & Co. and G. G. Stanford 1 U.S.D.A., C NW NW 23-6n-1e. Dry. TD 6,766 ft. Elev. 281 ft., Vicksburg 2,054 ft., Cook Mountain 2,950 ft., Sparta 3,176 ft., Wilcox 4,400 ft., base Big shale 5,770 ft., base Baker shale 6,230 ft.

Itawamba County: O. W. Killam 1 Adams, 33-8s-9e. Dry. TD 1,243 ft. in Mississippian Iowa, top 1,170 ft.

Smith County: Gulf Refining Co. 1 Tramel, near C NE SW 26-3n-8e. Dry. TD 14,583 ft. Elev. 380 ft., Midway 3,920 ft., Eagle Ford 5,688 ft., Tuscaloosa 6,122 ft., marine Tuscaloosa 6,883 ft., lower Tuscaloosa 7,050 ft., Lower Cretaceous 7,440 ft., Glen Rose 9,560 ft., Cotton Valley 12,720 ft.

Wayne County: Clinch Drilling Co. 1 G.M. &O., N½ SW NW SE 19-6n-6w. Dry. TD 5,613 ft. Elev. 222 ft., Wilcox 1,425 ft., Eutaw 6,160 ft., Stanley 6,178 ft.

SOUTH LOUISIANA

Calcasieu Parish: Lamson, Bennett & Cole 1 Lutcher-Moore, 15-8s-12w. Dry. TD 7,416 ft.

WILDCAT COMPLETIONS

Ohio Oil Co. 26 Brown, 20-11s-13w. IP 326 BOPD, 10/64-in., 41.3°, casing perforations 8,494-8,508 ft. TD 8,5877 ft. (New pay in Phoenix Lake field.)

Iberville Parish: Shell Oil Co. 1 Baist, 13-10s-11e. Dry. TD 11,493 ft.

Plaquemines Parish: Kerr-McGee Oil Industries, Inc., 1-F State Lease 1237, Block 45, Breton Sound. IP 3,260 M.c.f. daily, 20/64-in., Miocene 3,841-46 ft. (casing perforations). TD 7,860 ft. (New field.)

Rapides Parish: Butler-Johnson 1 Hellands, 23-2n-4w. IPP 80 BOPD, casing perforations 8,592-94 ft. TD 8,925 ft.

NORTH LOUISIANA

Concordia Parish: H. L. Hunt et al 1 Learned, 27-2n-8e. Dry. TD 9,042 ft.

Webster Parish: John B. Stephens et al 2 Griffin, C SW SE SW 2-23n-11w. Dry. TD 5,992 ft.

OKLAHOMA

Hughes County: Ned Biffle 1 Moore, SW SW SW 17-5n-9e. IPP 20 BOPD, sand 2,694-2,793 ft. TD 2,832 ft.

Kay County: Hammer & McLean 1 J. Bahara, NE SE NE 2-28n-3e. Dry. TD 3,237 ft.

Lincoln County: Hefner Production Co. 1 Burkett, SW SE NW 23-14n-2e. Dry. TD 5,290 ft., Wilcox 5,208 ft.

Midstates Oil Corp. 1 Addie Braden, NW NW SW 2-15n-2e. Dry. TD 5,220 ft., Wilcox 5,152 ft.

Puckett Drilling Co. 1 Orr, SE NE NW 24-15n-6e. Dry. TD 4,275 ft., Wilcox 4,214 ft.

Logan County: Russell Maguire 1 Atkinson, SE NE NE 13-16n-2w. Dry. TD 5,897 ft., second Wilcox 5,864 ft.

Davon Oil Co. 1 Quinlan, NW NW SE 22-16n-4w. Dry. TD 7,384 ft., Wilcox 7,321 ft.

Oklahoma County: Canadian Oil & Gas Co. 1 Canada, SW SW SW 10-14n-1e. Dry. TD 5,739 ft.

Pawnee County: Murphy Oil Co. of Oklahoma 1 Gilliland, SE NE NW 32-23n-4e. Dry. TD 4,037 ft.

Pottawatomie County: Mack Oil Co. 1 Hudson, SW SW SW 30-7n-2e. Dry. TD 6,255 ft., second Wilcox 6,215 ft.

Seminole County: F. McCormick 1 Darrah-Greer, SE NW NW 36-6n-6e. Dry. TD 2,777 ft.

KANSAS

Cowley County: Laura Jane 1-A C. A. Bolack, NW SE SW 16-32s-6e. Dry. TD 3,126 ft.

Drillers Producing Co. 1 Godfrey, NW NE NE 3-34s-3e. IPP 42 BO plus 34 BWPD. Bartlesville 3,362-70 ft. TD 3,370 ft.

Martin and Cash 1 Land & Power, CEL NW NW 25-34s-3e. Dry. TD 3,331 ft.

Sampson-Moore 1 Lester, NE NE NW 6-34s-6e. IPP 15 BOPD. Layton 2,239-45 ft. TD 2,245 ft.

Ellis County: Schafer 1 Elmore, NE NE NE 35-15s-20w. Dry. TD 3,872 ft.

D. Pratt 1 Stecklein, SE SE SE 12-15s-18w. IPP 45 BO plus 33 BWPD. Arbuckle 3,568-72 ft. TD 3,572 ft.

Harvey County: Westgate-Greenland 1 Ullum, NW NW NW 10-22s-2e. Dry. TD 3,304 ft.

Hodgeman County: Atlantic Oil & Refining Co. 1 R. E. Hall, NW SE 36-23s-22w. IPP 695 BO plus 44 BWPD. Lansing-Kansas City 4,284-95 ft. TD 4,982 ft. Mississippian 4,509 ft. Viola 4,803 ft.

"It's oil, dear--LANE-WELLS on the job"

This advertisement is neither an offer to sell nor a solicitation of offers to buy any of these securities. The offering is made only by the Prospectus.

NEW ISSUE

May 26, 1953

$162,098,500

Phillips Petroleum Company

3.70% Sinking Fund Debentures due 1983

(Convertible into Common Stock until June 1, 1963)

Dated June 9, 1953 — Due June 1, 1983

Holders of the Company's outstanding Common Stock are being offered the right to subscribe at 100% for these Debentures in the ratio of $100 principal amount of Debentures for each nine shares of Common Stock held of record on May 26, 1953. Subscription Warrants will expire at 3:30 P.M., Eastern Daylight Saving Time, on June 9, 1953.

The several Underwriters have agreed, subject to certain conditions, to purchase any unsubscribed Debentures and, both during and following the subscription period, may offer Debentures as set forth in the Prospectus.

Copies of the Prospectus may be obtained from any of the several underwriters, including the undersigned, only in States in which such underwriters are qualified to act as dealers in securities and in which the Prospectus may legally be distributed.

The First Boston Corporation

Dillon, Read & Co. Inc. — **Kuhn, Loeb & Co.**

Union Securities Corporation — **Blyth & Co., Inc.** — **Eastman, Dillon & Co.**

Glore, Forgan & Co. — **Goldman, Sachs & Co.** — **Hallgarten & Co.**

Harriman Ripley & Co. Incorporated — **Hemphill, Noyes & Co.** — **Kidder, Peabody & Co.**

Lazard Frères & Co. — **Lehman Brothers** — **Merrill Lynch, Pierce, Fenner & Beane**

Smith, Barney & Co. — **Stone & Webster Securities Corporation** — **White, Weld & Co.**

WILDCAT COMPLETIONS

Simpson 4,912 ft. Arbuckle 4,939 ft. TD 4,982 ft. PB 4,420 ft.

Kingman County: Musgrove et al Stucky, NW NW SW 30-27s-6w. Dry. TD 4,416 ft. Arbuckle 4,386 ft.

Logan County: Wycoff et al 1 Bretz, NE NE SE 5-12s-37w. Dry. TD 4,912 ft.

Meade County: Columbian Fuel Oil Co. 1-B B. Meyer, SW NE 20-33s-30w. IPP 138 BOPD. Pay zones 5,704-95 ft. and 5,693-5,700 ft. TD 6,156 ft. Marmaton 5,646 ft. Chester 5,708 ft. St. Genevieve 5,988 ft. St. Louis 6,148 ft.

Pawnee County: Musgrove 1 Lucas, NE NE NE 13-21s-18w. Dry. TD 4,056 ft. Pre-Cambrian 4,053 ft.

Phillips County: W. J. Coppinger 1 Hartzog, NE NE NW 34-1s-19w. Dry. TD 3,795 ft.

Pratt County: Champlin Refining Co. 1 Henderson "B," NE SE SE 10-26s-14w. IPF 237 BOPD. Kinderhook 4,246-52 ft. TD 4,538 ft.

Reno County: Morris Mizel 1 Blocker, NE NE SE 23-26s-5w. Dry. TD 4,155 ft. Viola 4,004 ft. Simpson 4,020 ft. Arbuckle 4,130 ft.

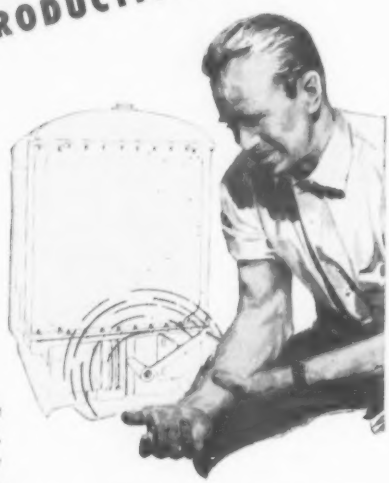
Rooks County: Strain Drilling Co. and Brooks Hall 1 Annon, SW SW NW 26-10s-20w. Dry. TD 3,800 ft.

Trego County: The Texas Co. 1 L. Deutscher "B," SW SW NW 35-12s-21w. Dry. TD 3,874 ft.

Midwestern Contractors 1 Kraft, NE NE SE 8-15s-23w. Dry. TD 4,666 ft.

STOP CRANK "KICK BACK" MISERY

STOP TIME, PRODUCTION LOSSES



WITH THE Safety Crank

Crank "kick-back" accidents are impossible with a SAFETY CRANK. The crank's mechanism will allow it to turn only *one way*. If the engine "kicks back" the crank jams instantly . . . will not permit the handle to whip back even a hundredth of an inch. Compression shock is taken up by the SAFETY CRANK'S friction clutch.

If you now start your engines with a crank or a rope, you're taking unnecessary chances when a SAFETY CRANK will fit *any* engine that can be hand started. Just tell us what kind of engine you have. We'll send an adapter and a bracket to fit it along with a rope pulley or crank handle.

With the SAFETY CRANK you get safe, quick engine starting that also saves you money . . . saves the expense of electrical system repairs and battery replacements.

Why take chances with dangerous, outdated cranks and pulleys? Write today for free literature . . . see for yourself why major oil, pipeline and construction companies now depend on SAFETY CRANK.

SAFETY CRANK CO. BOX 101, CENTRALIA, ILL.

NEBRASKA

Cheyenne County: The Chicago Corp. and Republic Natural Gas Co. 1 Nichols-State, NE NE SE 36-14n-51w. IPP 25 BOPD, "J" sand discovery, new pool, "J" sand 4,949 ft. TD 4,962 ft.

Superior Oil Co. 15-15 Jenik, NW NW SW 15-13n-47w. Dry. TD 4,154 ft.

Cheyenne County: Ohio Oil Co. 1 Campbell, NE NE NE 11-16n-50w. Dry. TD 4,854 ft.

Dawes County: E. D. Warner 3 Ormesher, NW SE 8-34n-48w. Dry. TD 1,913 ft.

Kimball County: Rocky Mountain Oil Corp., and Anderson-Prichard and Rogers Oil 1 Norber, SW SW SW 23-14n-57w. Dry. TD 6,908 ft. "J" sand 6,848 ft.

Magnolia Petroleum Co. 1 State, SW SW NW 16-12n-57w. IPP 141 BOPD, "J" sand discovery, new field, TD 7,045 ft.

SOUTH DAKOTA

Harding County: Carter Oil Co. 1 Hendricks, C SW NW 2-20n-3e. Dry. TD 8,393 ft. Jefferson 7,688 ft.

CALIFORNIA

Fresno County: Bolsa Chica Oil Corp. 1 W. J. Noble, 4-15s-17e. Dry. TD 5,200 ft.

Kern County: Acorn Drilling Co. 1 Acorn, 21-25s-18e. Dry. TD 160 ft.

R. S. Rheem, Operator 54-8 Ross-Kirschenmann, 8-30s-29e. Dry. Jewett 5,542 ft., Pyramid Hills 5,595 ft., Vedder 5,706 ft., TD 5,943 ft.

Universal Consolidated Oil Co. 15 Conoco, 21-25s-20e. Dry. TD 3,320 ft.

Esendee Oil Co. 1 Esendee West Pet., 29-29s-21e. Dry. TD 1,115 ft.

Kern Oil Co., Ltd., 76 Hanna, 28-29s-29e. Dry. TD 4,900 ft.

La Liebre Oil Co. 1 "Well," 22-9n-17w. Dry. TD 1,497 ft.

Los Angeles County: Morton & Dolley 1 M J M & M-Lindsay, 26-5n-17w. Dry. TD 1,340 ft. in Radovich sand.

C. C. Killingsworth, Opr. 2 Baldwin, 31-1s-11w. Dry. TD 7,147 ft.

Rothschild Oil Co. 1 Ayala, 29-5n-17w. Dry. TD 7,506 ft.

The Texas Co. A-2 Newhall, 8-4n-16w. Dry. TD 10,697 ft.

Orange County: Shell Oil Co. 73-18 Wright, 18-3s-8w. Dry. TD 5,541 ft.

Red Star Oil Co. 1 Red Star Lomita, 29-5s-11w. Dry. TD 4,480 ft.

San Luis Obispo County: A. C. Fisher & J. H. Maurer 1 Edwards, 36-11n-26w. Dry. TD 953 ft.

Sutter County: Richfield Oil Corp. 5 Butte Comm. B, 4-15n-2e. Dry. TD 4,132 ft.

Ventura County: H. S. Rothschild & J. E. Kebow 1 Courtney Community, 21-3n-23w. Dry. TD 11,315 ft.

Yolo County: Standard Oil Co. 1 E. C. Dwyer, 21-7n-4e. Dry. TD 8,202 ft.

MONTANA

Carbon County: Cities Service Oil Co. 1 Creek Area Government, C NW SW 33-6s-21e. IPP 27 BOPD, Phosphoria discovery, new field. Madison 8,259 ft. TD 8,259 ft.

WYOMING

Fremont County: J. K. Wadley 1 Government, SE SE SE 33-29n-93w. Dry. TD 4,700 ft.

UTAH

Duchesne County: Union Oil of California 1 Lytel, NE SW 9-2s-5w (USM). Dry. TD 10,012 ft. Green River 5,705 ft.(?).

Grand County: Glen M. Ruby 1 Unit, SE NW NW 11-26s-19e. Dry. TD 8,213 ft. Devonian 8,105 ft.

WILDCAT COMPLETIONS

COLORADO

Archuleta County: J. E. Mavor et al 1 Snook heirs, NE NE NE 18-34n-1w. Dry. TD 1,331 ft. quartzite cong. 1,303 ft.

Logan County: Count Dunaway 1 Lutcher, SE SE SE 27-8n-54w. Dry. TD 5,303 ft.

Sunbeam Oil (Eddie Fisher) and Reco Oil and Stout Oil 1 Whitcomb, C SW SW 15-9n-52w. Dry. TD 4,809 ft.

Chet E. Miller et al 1 H&O Smith, NW NW SW 14-9n-55w. Dry. TD 5,734 ft.

Moffat County: Carter Oil Co. 1 Olson, NW NE NE 9-7n-93w. Dry. TD 11,445 ft. Nugget 11,360 ft.

Morgan County: Sherrod & Apperson 1 Endsley, NW NW NE 6-3n-60w. IPP 25 BOPD, Greenhorn discovery, new field. TD 6,411 ft.

Sunbeam Oil and Denver Basin 1 State, SE SE SE 2-1n-56w. Dry. TD 5,170 ft.

La Gloria Corp. 1 Wm. Epple, C SE NW 29-2n-60w. Dry. TD 6,591 ft.

Falcon-Seaboard 1 Arneill, SW SE NE 8-4n-57w. Dry. TD 5,865 ft.

Sherrod & Apperson O-1 Milliron State, NW SW NW 15-4n-60w. Dry. TD 6,377 ft.

Weld County: Continental Oil Co. 1 Perry, C SW NW 13-9n-61w. Dry. TD 8,516 ft.

MANITOBA

Coates 20-13, LSD 7, 3-10-28w1. Dry. TD 3,155 ft.

SASKATCHEWAN

Socony 11-8 Weyburn, LSD 8, 11-8-14w2. Dry. TD 5,508 ft.

Socony-Woodley-Southern 10-13 Simmie, LSD 13, 10-11-16w3. Dry. TD 5,128 ft.

ALBERTA

Diligence 1, LSD 4, 27-57-24w4. Dry. TD 4,210 ft.

Socony-Seaboard 1 Pembina, LSD 4, 16-48-8w5. Suspended. TD 9,425 ft.

Widney 1 Vilna, LSD 7, 28-58-15w4. Dry. TD 3,239 ft.

New Br. ,sh 11-12 Inter Rock, LSD 11, 12-38-21w4. Dry. TD 5,404 ft.

Canadian 11-23 Montana Well, LSD 11, 23-5-14w4. Dry. TD 3,150 ft.

Union-Canadian Montana Gas Co. 1 MacKenzie, LSD 6, 30-5-12w4. Dry. TD 3,160 ft.

Imperial 15-22 Zama Lake, LSD 15, 22-115-10w6. Dry. TD 6,512 ft.

"As I was saying, something's got to be done about our foreign policy toward oil."

Salina Basin Discovery Going on Pump In Marion

At the extreme southern end of the Salina basin of Kansas, H. B. Ratzlaff and others are putting 1 Groening, NE NW SW 16-19s-4e, Marion County, on the pump. The wildcat, located 1 mile southeast of Propp pool, indicated a potential in excess of 100 bbl. of oil per day on swab tests in the Mississippi following fracture treatment of open hole at 2,319-50 ft.

The southern end of the Salina basin has recorded four new pool discoveries this year. Marion County's new pools are Durham and Edmonds, while Lively pool was opened recently in McPherson County. A new Viola pool was recently opened in Saline County. These new discoveries have further increased interest in the Salina basin of Kansas. This basin covers an area of about 41,000 square miles of northeastern Kansas and southeastern Nebraska, but has no production except along its southern margin.

Second Test on Grayson Wildcat Shows Oil

Superior Oil Co. 1 E. A. Sturgess, Grayson County, Texas, wildcat 2 miles northeast of Whitesboro in the M. B. Lamar Survey, reported oil recovery from two Pennsylvanian sand sections.

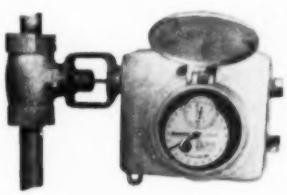
A 1-hour test from 6,055-63 ft. returned 367 ft. of free oil, 91 ft. of oil and salt water and 862 ft. of salt water. Second test from 6,123-30 ft. recovered 185 ft. of oil and 95 ft. of mud-cut oil. Operators continued drilling to test the Oil Creek.

In the Big Mineral Creek field, Sinclair

Save HOURS in the FIELD

ENARDO TIME CYCLE SWITCHES

Enardo "MB" and "A" model time-cycle switches pay for their cost in a matter of weeks by drastically decreasing return trips to shut down equipment. These automatic clock mechanisms, provided in 12 and 24 hour operating cycles, can be used to start or stop pumping engines . . . lighting circuits . . . electric motors . . . etc. Normal operating capacity for the "A" Mercury tube switch is 450 Watts open or closed circuit. Tube switches of higher wattage are available on request. The "MB" micro-switch operates at 60 Watts D.C. or 1250 Watts A.C., open or closed circuit. Switches are dust, fire, tamper and explosion proof. Write for Enardo bulletins 10-01, 10-03.



ENARDO CLOCK SHUT-OFF VALVE

The Model "W" Enardo Clock Shut-Off Valve is designed to control the flow of low-pressure gas or liquid and to shut off the supply at a pre-determined time. It is completely automatic and can be safely used on any gas or liquid flow line where pressures do not exceed 100 lbs. Timing mechanism on the valve can be supplied for either 12 or 24 hour operating cycles. The assembly consists of a stainless steel trimmed valve with a cast iron body mounted on a housing containing the valve tripping linkage and clock actuating mechanism. Write for bulletin 10-05.

ENARDO manufacturing company

BOX 1647 • TULSA, OKLAHOMA

Truth in Advertising Builds Confidence.

Oil & Gas Co. 3 Barnes plugged back from 10,581 ft. to complete in one of the field's regular shallow pays, around 5,230 ft. Completion potential was 373 bbl. of 39° oil a day through ⅜-in. choke.

Oklahoma Pool Well Flows at Prolific Rate

Kendrick pool, Lincoln County, Oklahoma's most active area, continues to produce prolific wells. On the southwest side of the significant new pool Sun Oil Co.'s Inman lease is proving to be one of the field's most prolific wells. The well flowed 300 bbl. of oil in 3¼ hours after acid treatment of perforations in the Oswego lime on a ¾-in. choke. Sun's well, the 4 Inman in the NW NW NE Section 9-15n-5e, is the west offset to 3 Inman, which flowed 438 bbl. of oil in 18 hours during initial tests.

The major portion of exploratory work in Oklahoma continues to be in the central counties of Lincoln and Logan.

Lincoln County has three new wildcats scheduled. Bay Petroleum Co. will drill a 4,400-ft. test 1¼ miles northwest of Stroud, about 2 miles northeast of an indicated Prue sand discovery by E. J. Athens. Harper-Turner will drill a 3,500-ft. test ¾ mile north of abandoned Davenport pool production.

New Pool Possible in Ellis County, Kansas

Victor Drilling Co. has a probable new discovery in the southwestern part of Ellis County at 1 Reichert, NW NW NE 9-15s-19w. The wildcat is 3 miles northeast of Penny-Wann pool, Kansas.

A drill-stem test at 3,404-55 ft. in the Lansing recovered 1,740 ft. gas, 120 ft. gas-cut mud, 60 ft. of oil and gas-cut mud, and 240 ft. very heavily oil and gas-cut mud. A drill-stem test in the Arbuckle at 3,677-83 ft. recovered 25 ft. heavily oil-cut mud, and further oil shows were found to 3,687 ft., total depth.

Development Continues At North Orlando Pool

A good flowing well was added to the growing list of completions in North Orlando pool in Noble County, Oklahoma. Barrett, Musgrave, Catlett and Midwest Oil 2 Schnurr, NW NE NW 30-20n-1w, flowed 156 bbl. of oil per day on a 14/64-in. choke. After fracture treatment the well flowed 40 bbl. of oil in 3½ hours from the Skinner.

Skinner sand pay was opened in the pool this spring by the same operators at 1 Steiner, SE SW SW 19-20n-1w. Prior to the Skinner sand discovery, which flowed 75 bbl. per day, the area produced only gas from the Perry sand.

McClain Discovery in Oklahoma Proves More Pay

A Bromide sand discovery in Oklahoma's McClain County is proving additional pay. Magnolia Petroleum Co. 1 Gladys Love, SW SW 4-5n-2w, flowed at the rate of 28 bbl. of oil per hour on drill-stem test at 8,339-69 ft. Recovery on the test was 5,000 ft. of oil. Recovery on a test taken at 8,337-52 ft. was 4,300 ft. of oil. A previous test at 8,311-21 ft. flowed 26 bbl. of oil per hour.

Deep Warrior Basin Test Showing for Production

Continuing tests at Carter Oil Co.'s deep Black Warrior basin wildcat in northeastern Clay County, Mississippi, are enhancing the prospects of establishing commercial production.

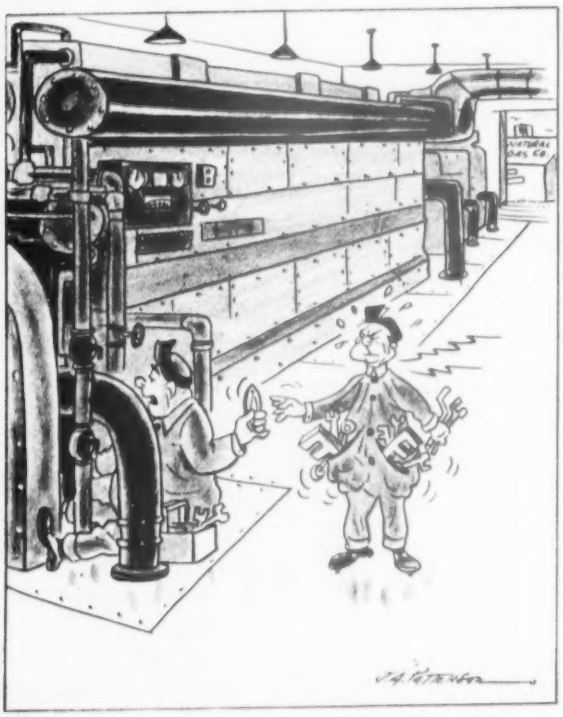
The indicated well, 1 McFaddin, which failed to develop commercial production in its lower zones, tested at 9,304-11 ft. and 9,332-64 ft., has been plugged back, and now is perforated in a shallower prospective pay zone at 8,610-29 ft.

On a 16-hour gage through ⅝-in. choke, it flowed at the rate of 1,339,000 cu. ft. of gas with 23 bbl. of condensate per day under tubing pressure 605 psi. On a 12-hour gage through ¼-in. choke, the flow was at the rate of 747,000 cu. ft. of gas and 7 bbl. of condensate per day with tubing pressure of 1,150 psi.

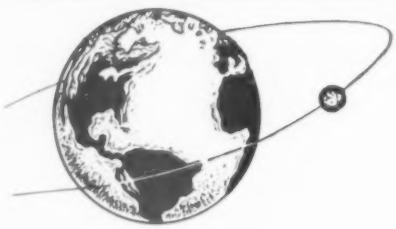
Hole had been drilled to 9,580 ft. in the lower Mississippian, and has casing run to 9,444 ft. Location is in 36-16s-5e, 4 miles northwest of West Point.

CORRECTION

North American Petroleum Co. 2 R. E. Viall, Bell County, eastern Kentucky, which was reported as a dry hole in the June 1 issue of the Journal, was still cleaning out after shooting the Corniferous at last report. The open-flow potential of the well was estimated at approximately 180,000 cu. ft. of gas daily with a rock pressure of 535 psi.



"Here—hold this for me, too, Gus."



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records indicate D & S equipment

is giving the best performance

at less cost per foot!

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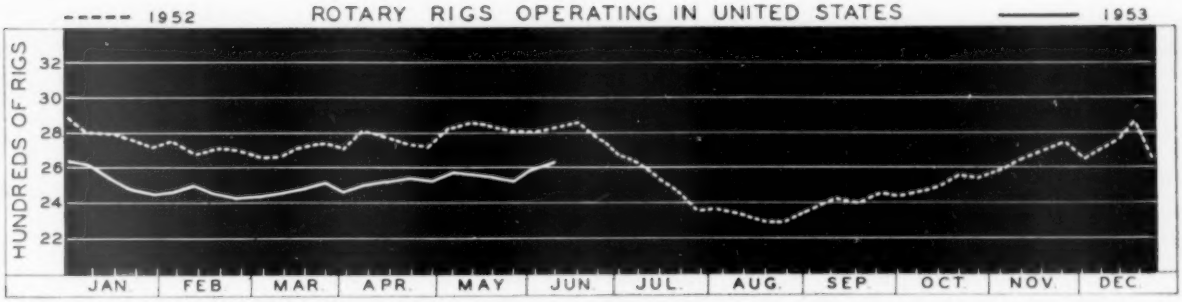
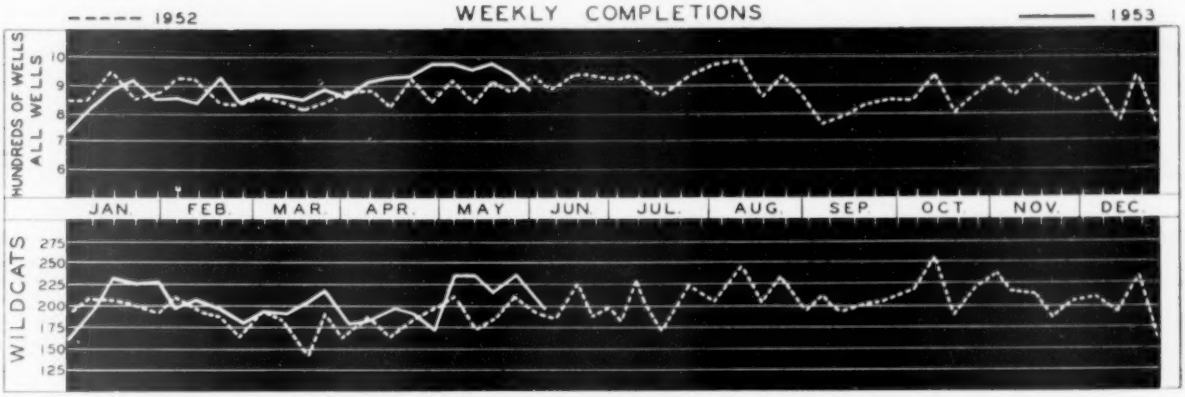
Dallas 1, Texas

Core barrels, Truco diamond coring and drilling bits, straight hole drilling, washover shoes, whipstock, window cutting





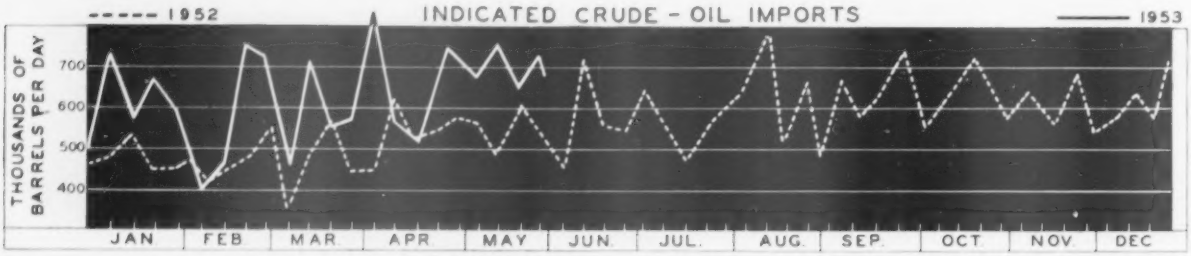
CURRENT STATISTICS

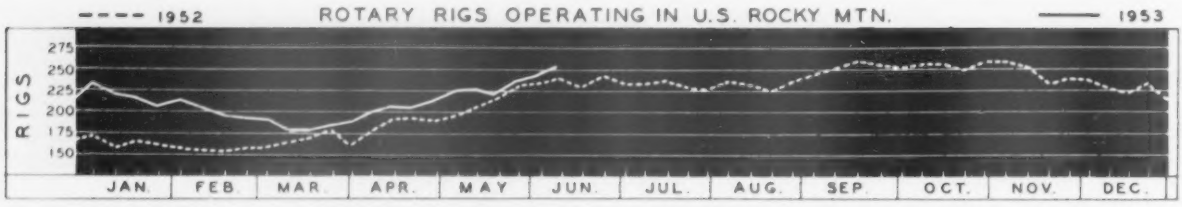
EXPLORATION

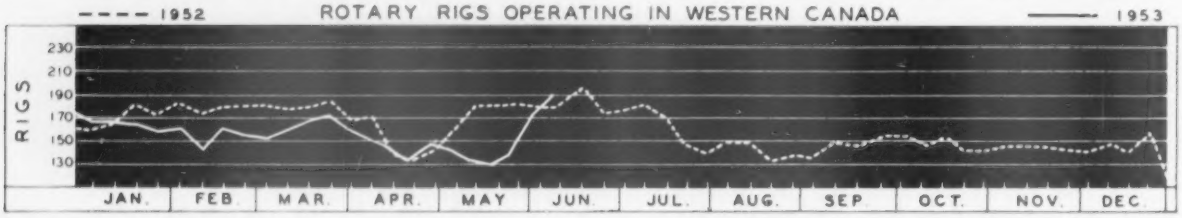
WEEKLY WELL COMPLETIONS . . . WEEK ENDED JUNE 6, 1953

	Total of all wells					June 6		Wildcat completions and discoveries					Cumulative total, 1953				
	Comp.	Oil	Gas	Dry	Footage	1953	1952	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	13	7	0	*6	19,200	293	339	0	0	0	0	0	0	0	0	0	0
Pennsylvania	33	16	4	†13	62,100	725	733	0	0	0	0	0	0	0	3	8	11
West Virginia	12	1	11	0	39,879	253	257	0	0	0	0	0	0	0	4	2	6
Ohio	22	12	1	‡9	44,519	427	413	0	0	0	0	0	1	0	1	10	12
Indiana	11	3	0	8	15,851	503	484	0	0	0	5	5	8	0	2	119	129
Kentucky	17	5	4	8	42,151	449	568	0	0	0	3	3	5	0	0	81	86
Illinois	37	16	0	21	93,549	728	682	0	0	0	5	5	3	0	0	146	149
Michigan	9	6	0	3	21,895	232	294	1	0	0	3	4	8	0	3	93	104
Kansas	95	47	2	46	345,086	2,115	2,023	6	0	0	12	18	50	0	19	325	394
Nebraska	8	4	0	4	41,229	128	97	2	0	0	4	6	10	0	1	57	68
Oklahoma	152	91	9	52	572,837	3,012	2,549	1	0	0	10	11	51	4	13	270	338
Texas	300	161	19	120	1,400,889	7,343	7,969	13	2	3	78	96	372	27	90	1,795	2,284
North Central (Dist. 7-B & 9)	116	69	0	47	360,460	2,677	2,518	7	0	0	23	30	190	0	9	733	932
West (Dist. 7-C & 8)	64	42	2	20	379,562	1,613	2,494	3	0	1	15	19	76	2	6	282	366
Panhandle (Dist. 10)	11	4	5	2	35,034	353	294	0	0	0	2	2	0	2	0	12	14
Eastern (Dist. 5 & 6)	18	5	2	11	76,987	352	390	1	0	0	10	11	12	2	3	122	139
Gulf Coast (Dist. 2 & 3)	41	20	6	15	301,787	1,099	1,181	1	2	2	11	16	51	7	40	280	378
Southwest (Dist. 1 & 4)	50	21	4	25	247,059	1,249	1,092	1	0	0	17	18	43	14	32	366	455
Louisiana	31	11	6	14	180,162	1,063	977	2	0	1	4	7	27	9	11	144	191
Northern	17	4	2	11	64,062	418	504	0	0	0	2	2	1	1	2	50	54
Southern	14	7	4	3	116,100	645	473	2	0	1	2	5	26	8	9	94	137
Arkansas	8	6	0	2	32,578	191	162	0	0	0	0	0	5	0	0	35	40
Mississippi	9	4	0	5	76,923	150	167	1	0	0	4	5	8	0	3	73	84
Southeastern States	1	0	0	1	3,829	57	26	0	0	0	1	1	1	0	0	42	43
Montana	6	5	1	0	20,942	157	96	1	0	0	0	1	3	0	0	38	41
Wyoming	11	8	0	3	66,334	250	274	0	0	0	1	1	7	0	0	41	48
Colorado	19	5	3	11	101,589	221	169	1	0	0	10	11	9	0	7	108	124
Utah	2	0	0	2	18,225	33	30	0	0	0	2	2	2	0	0	21	23
New Mexico	32	12	19	1	171,279	568	431	0	0	0	0	0	8	0	6	54	68
California	53	30	2	21	225,258	1,107	1,092	0	0	0	18	18	24	0	3	253	280
North Dakota	2	2	0	0	16,655	106	18	0	0	0	0	0	3	0	0	20	23
Miscellaneous (S. D.)	1	0	0	1	8,393	21	37	0	0	0	1	1	1	0	0	17	18
Total United States	884	452	81	351	3,621,352	20,132	19,887	28	2	4	161	195	606	40	166	3,752	4,564
Total previous week	941	493	78	370	3,846,004			30	4	10	192	236	578	38	162	3,591	4,369
Total June 7, 1952	907	469	52	386	3,879,439			23	1	2	159	185	621	45	109	3,465	4,240

Service wells included: *6, †11, ‡4.





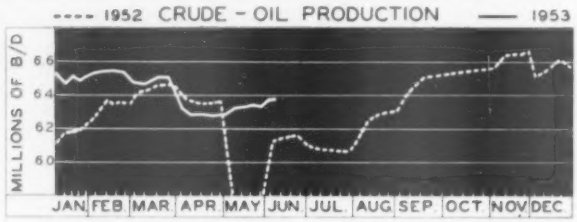


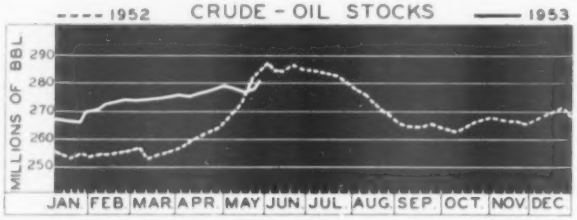
DAILY AVERAGE PRODUCTION FOR WEEK

	June 6			May 30
	Crude oil	Lease condensate	Total	total
Alabama	5,000		5,000	4,900
Arkansas	76,750	700	77,450	77,800
California	1,002,800		1,002,800	1,001,850
Colorado	99,900		99,900	99,700
Eastern	58,600		58,600	58,100
Florida	1,450		1,450	1,450
Illinois	159,700		159,700	162,700
Indiana	35,800		35,800	35,600
Kansas	287,300		287,300	321,500
Kentucky	30,400		30,400	30,200
Louisiana	664,400	37,700	702,100	701,975
North	110,650	2,700	113,350	113,150
South	553,750	35,000	588,750	588,825
Michigan	32,800		32,800	36,700
Mississippi	93,900	4,450	98,350	97,500
Montana	30,400		30,400	31,000
Nebraska	14,000		14,000	13,700
New Mexico	194,050	950	195,000	189,925
Oklahoma	533,100		533,100	531,900
Texas	2,748,050	44,525	2,792,575	2,717,050
Dist. 1	36,100	400	36,500	35,425
Dist. 2	152,750	5,850	158,600	152,825
Dist. 3	445,950	22,700	468,650	461,625
Dist. 4	257,500	5,650	263,150	253,925
Dist. 5	48,450	350	48,800	47,100
Dist. 6	121,250	5,200	126,450	125,650
East Texas field	252,150		252,150	247,000
Dist. 7-B	114,750	50	114,800	108,075
Dist. 7-C	160,650	3,650	164,300	155,300
Dist. 8	907,600	200	907,800	888,450
Dist. 9	176,150	450	176,600	168,950
Dist. 10	74,750	25	74,775	72,725
Utah	5,200		5,200	5,000
Wyoming	210,900		210,900	211,300
North Dakota	14,700		14,700	14,000
Total U. S.	6,299,200	88,325	6,387,525	6,343,850
Change from previous week, up			43,675	
Canada	174,850		174,850	212,975

Total U. S. production January 1-June 6 1,008,205,700 bbl.
Same period last year (crude plus cond.) *963,541,800 bbl.

*Includes 13,983,760 bbl. condensate.



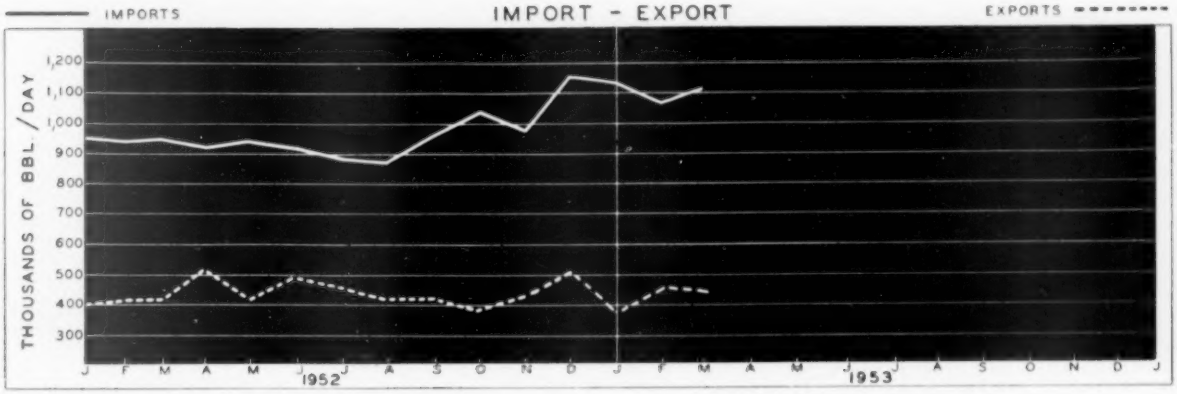


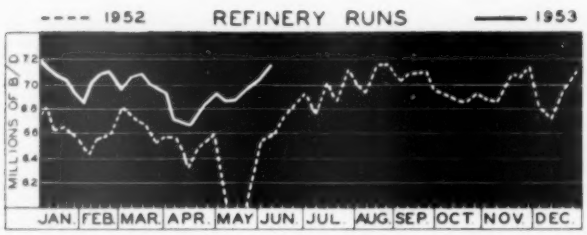
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

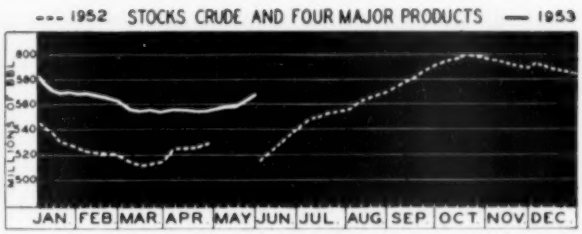
(Thousands of barrels)

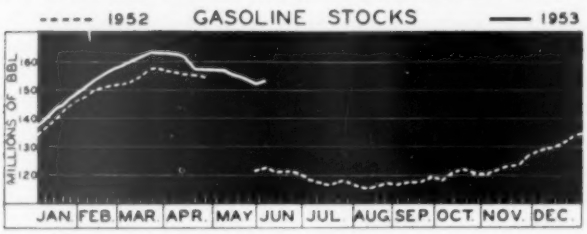
	May 30, '53	May 23, '53	May 31, '52
Pennsylvania Grade	2,543	2,509	2,538
Other Appalachian	2,231	2,100	2,043
Illinois, Indiana, Michigan	12,045	11,974	13,239
Arkansas	2,770	2,917	3,217
Louisiana	16,552	16,407	16,168
North	2,738	2,833	2,965
Gulf	13,814	13,574	13,203
Mississippi	3,801	4,044	3,651
New Mexico	7,215	7,090	7,549
Oklahoma and Kansas	39,533	38,630	42,892
Texas	132,852	132,324	141,630
East Texas proper	11,620	11,305	14,293
West Texas	62,616	62,768	60,459
Texas Gulf	25,628	25,496	33,308
Other Texas	32,988	32,755	33,570
Rocky Mountain	18,169	17,779	16,031
California	32,689	32,361	30,438
Foreign	10,281	10,155	8,630
Total	280,681	278,290	288,026

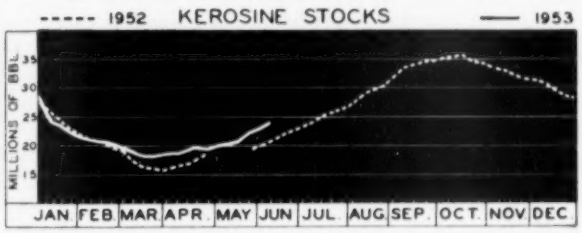
*Bureau of Mines.

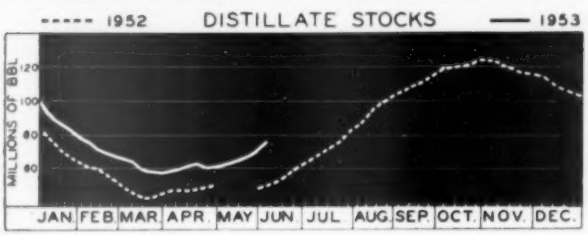


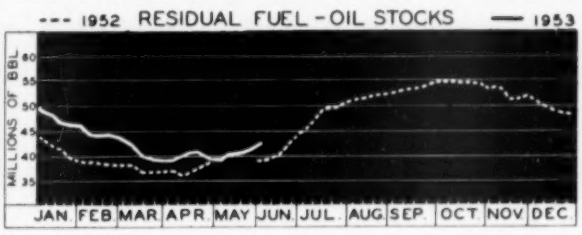










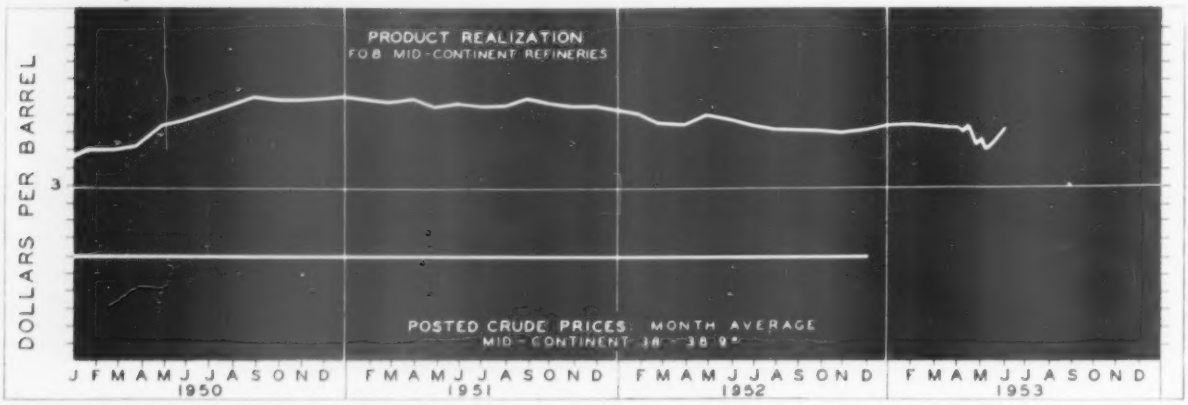


A.P.I. REFINERY REPORT, JUNE 6

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, June 1952 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,070	454.9	36.3	276.3	227.0	34,443	10,476	24,859	11,206	1,125	419.0	35.7	256.1	240.1
Appalachian:														
District 1	98	40.3	5.7	15.0	20.6	3,648	491	852	380	110	48.0	4.6	14.5	13.2
District 2	89	39.7	3.9	9.3	12.4	1,605	276	413	154	77	38.4	2.0	12.9	12.3
Ind., Ill., Ky.	1,279	688.4	71.3	221.0	156.7	30,655	4,355	11,417	3,328	1,240	659.8	67.5	230.8	156.4
Okla., Kans., Mo.	603	351.1	13.3	144.6	52.0	16,442	1,462	8,221	1,231	540	294.9	15.6	126.6	51.8
Inland Texas	232	160.3	12.8	37.3	28.6	6,368	436	1,334	1,103	271	171.9	11.1	44.8	41.2
Texas Gulf Coast	1,797	868.9	113.4	448.7	246.6	21,150	3,570	11,233	6,522	1,603	717.6	118.0	418.9	259.5
La. Gulf Coast	577	292.1	28.4	173.6	68.6	8,044	2,192	5,297	1,472	538	236.8	45.3	132.3	52.8
N. La. and Ark.	86	28.6	8.3	21.7	6.7	3,237	324	1,071	160	85	32.8	6.5	19.4	5.8
Rocky Mountain:														
New Mexico	20	13.0		3.1	4.0	180		35	30	18	10.9	.3	2.9	4.2
Other Rocky Mtn.	243	115.1	2.0	55.1	42.1	6,622	248	1,995	961	235	110.8	6.3	45.1	40.9
California	1,074	488.6	5.9	182.4	322.1	20,198	404	10,084	15,906	983	428.3	4.4	150.4	349.4
June 6, 1953	7,168	3,541.0	301.3	1,588.1	1,187.4	152,592	24,234	76,811	42,453	6,825	3,169.2	317.3	1,454.7	1,227.6
May 30, 1953	7,047	3,373.4	359.7	1,409.7	1,223.4	152,435	23,527	70,842	41,425					
June 7, 1952	6,598	3,102.3	315.1	1,372.3	1,193.6	123,436	20,382	53,668	39,088					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.


PRODUCT REALIZATION
F.O.B. MID-CONTINENT REFINERIES
DOLLARS PER BARREL
3
POSTED CRUDE PRICES: MONTH AVERAGE
MID-CONTINENT 38° - 38.9°
J F M A M J J A S O N D
1950
F M A M J J A S O N D
1951
F M A M J J A S O N D
1952
F M A M J J A S O N D
1953

In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate and fuel oil. Realization averaged $3.31 for week ended May 30, $3.28 for previous week, and $3.41 for May 1952. The above trend information is based on volumes and current prices and therefore does not reflect changes in operating costs.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of June 10, 1953. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10⅜-10½	12-13	10¾-11
Premium gasoline	11⅜-11½	13.25-14	11¾-12
42-44 w.w. kerosine	8⅜-8¾	10-10.65	9
No. 2 straw fuel oil	7⅜-7¾	9-9.65	8
No. 6 residual	$0.90-1.00	$2.10-2.25	$1.60-1.70

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5½	5	5¼
Grade 18-55	6.60	6.10	6.35

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	12-13
750 vis., No. 3-4 neutral	15-16
2,000 No. 5-6 neutral	17-18

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	19.5 21
200 vis., No. 3 neutral, 0-10 pp.	13

Western Pennsylvania

145-155 vis., 10 p.t. bright stock	25.5
180 vis., 10 p.t. neutral	27.5

WAX

Mid-Continent

132-134 A.M.P.	6.0

PURCHASES of pipe-line gasoline by several large suppliers in District 2 have tended to keep the Group 3 gasoline market firm over the past week.

Unconfirmed reports indicate that some of the material moved at the low plus pipe-line transportation but most marketers are expecting prices of about "low plus 0.25 cent" by the first of July unless the general market strength results in an increase in the Group 3 low by that time.

Light heating oils have experienced little trading activity over the past few weeks. Most of the movement has been against contracts. In the Mid-Continent, refiners, for the most part, have enough storage space to take care of the exc ss from current production and are not offering material on the spot market.

There have been reports of several sales of No. 2 fuel for filling secondary storage, and in a few cases shifts in suppliers indicate summer discounts in buyer - seller agreements. However, there has been no public announcement of summer discount programs for home-heating fuels in District 2.

A general increase in gasoline prices on the East Coast may be in the making. Socony-Vacuum Oil Co., Inc., posted higher tank-car and tank-wagon prices for New York and New England areas, effective June 10. The tank-wagon increase for most areas was 0.7 cent a gallon except for parts of upstate New York where the raise was 0.6 cent.

Other major suppliers in these areas of the East Coast were studying the situation before deciding whether to meet the Socony increase. Market observers, however, said that high demand and the firm condition of the gasoline market made it likely that the increase will become general.

Socony cited increased costs and heavy expenditures as making higher prices necessary.

CRUDE PRICES GRAVITY SCHEDULE

	Signal Hill, Calif‡	Okla. homa, Kansas	Gulf Coast Tex.*	West Tex.†
14-14.9	$1.87			
15-15.9	1.93			
16-16.9	1.99			
17-17.9	2.05			
18-18.9	2.11			
19-19.9	2.18			
20-20.9	2.24	$2.25		$2.12
21-21.9	2.30	2.27		2.14
22-22.9	2.37	2.29		2.16
23-23.9	2.45	2.31		2.18
24-24.9	2.53	2.33	$2.56	2.20
25-25.9	2.61	2.35	2.58	2.22
26-26.9	2.69	2.37	2.60	2.24
27-27.9	2.76	2.39	2.62	2.26
28-28.9	2.83	2.41	2.64	2.28
29-29.9	2.91	2.43	2.66	2.30
30-30.9	2.97	2.45	2.68	2.32
31-31.9	3.04	2.47	2.70	2.34
32-32.9	3.12	2.49	2.72	2.36
33-33.9		2.51	2.74	2.38
34-34.9		2.53	2.76	2.40
35-35.9		2.55	2.78	2.42
36-36.9		2.57	2.80	2.44
37-37.9		2.59	2.82	2.46
38-38.9		2.61	2.84	2.48
39-39.9		2.63	2.86	2.50
40 and above		2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point.

†Includes Lea County, New Mexico.

Last general price change represented a 50 cent increase, effective December 6, 1947.

‡Standard Oil Co. of California.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

Louisiana:	
Beauregard Parish	$2.60
Cotton Valley (distillate)	2.85
Cotton Valley (crude)	2.70
Texas:	
East Texas	2.65
Pecos County (Yates)	2.35
Conroe	2.83
Van	2.48
Pennsylvania Grade:	
Bradford	4.40
Southwest Pennsylvania	3.97
West Virginia	3.9[illegible]
Illinois Basin	2.77

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DIESEL Generating Unit. 746 Hrs. operating time—37½ KVA, 3 Phase, 60 Cy. 220/40 V. 1800 RPM, Century Gener. connected to 72 HP Model 6DTG317 B/M #D3076 Buda Diesel. Price $3,000. Red Head Oil Co., Brilliant, Ohio.

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SUPERIOR HEAVY DUTY DIESEL

510 hp. at 360 r.p.m.—5 cylinder—14½x18 type ZDSB — non-reversing — vertical—4 cycle—cold starting—mechanical injection. Engine is totally enclosed. Complete with a 48" 7 groove V-belt sheave and new spare parts. For heavy duty pumping, dredge service, power generation, textile and saw mills, mining, etc. EXCELLENT CONDITION, IMMEDIATE DELIVERY.

G. M. 3-71 DIESEL GEN. SET

30 kw. 2 cylinder 4½x5 diesel—radiator cooled—electric starting. Delco 3-60-440 generator — with switchgear. Skid mounted. Portable.

30 KW SHEPPARD DIESEL SETS

30 kw. Sheppard—115 volts DC—radiator cooled . Built 1950. Excellent condition. Self-mounted radiator and fuel tank. 16 units available.

100 KW G. M. 3-268A A.C. DIESEL GENERATOR SETS

440 volts—3 phase—60 cycle. 20 kw. D.C. generator on same shaft—5 kw. exciter—120 volts D.C.—electric starting.

LORIMER SLOW SPEED 100 KW A.C. DIESEL GENERATOR SET

Slow speed heavy duty unit. 150 hp.—5 cyl.—4 cycle—720 r.p.m.—electric starting—Ross heat exchanger—engine operating panel. Allis-Chalmers generator—100 kw.—440/3/60—80% PF—cubicle deadfront switchgear. Can quote with radiator if desired.

300 KW G. M. D.C. DIESEL SET

ENGINE: G.M. 8-268A—6½x7—1200 r.p.m.—air starting. GENERATOR: 300 kw. G.E.—120/240 volts D.C.—3 wire—totally enclosed—Marine type BB—with switchgear.

ELECTRIC WINCHES

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STEAM TURBO-GENERATOR SETS

300 kw—120/240 volts D.C.—1200 r.p.m.—1250 amps.—turbine W.P., 225 lbs. to 440 lbs.

MARINE SURFACE CONDENSERS

1050 sq. ft.—3000 sq. ft.

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BALTIMORE 2, MARYLAND
CURTIS 7-5050

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DRILLING EQUIPMENT FOR SALE: Mud pumps, swivels, travelling blocks. This equipment is brand new and produced by a reliable manufacturer, and is offered for sale at reduced prices. Box G-523, The Oil and Gas Journal, Tulsa, Oklahoma.

TWO — 60W — BREWSTER — 6000' — Well-Servicing Units, Complete, W/Rod & Tubing Tools. 8 x 7 Double Pole Mast, Truck Mounted, Ready to Work. Also, Allis-Chalmers, Muskogee, Wilson & Cardwell Skid Units. General Tool & Supply Co. P.O. Box 4387. Oklahoma City, Okla.

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New and Used material—Immediate delivery from stock, Angles, Channels, I and WF Beams, especially for construction needs.

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Phone or Wire your steel requirements.

We are also interested in purchasing your surplus material. We assure you our prices will be the best obtainable.

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2—Model 07 Murray and Tregurtha Harbormaster Outboard Propulsion Units with twin 6-71 GM Diesel Engines. Each unit rated 330 horsepower. Ideal power units for barge used in connection with off shore drilling. Sohio Petroleum Company, 407 N. 8th St., St. Louis, Missouri.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.

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COMPLETE ROTARY DRILLING RIG

1—Wilson Super Titan Draw Works—Complete with Foster Spinning Cathead—Foster Breakout Head—Double Hydraulic Brakes—Four Engine Compound—Air Control operated with Westinghouse Compressor.

4—Cummins 600 Disel Engines with Substructures.

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1—8" x 20" Gardner Denver Power Pump complete.

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2—Cameron 900 Series 10" Blowout Preventors.

15—6" x 30" Drill Collars.

Approx. 13,000 feet of 4½" OD 16.60 lb. Grade "E" Extra Hole Drill Pipe—Flashweld Joints.

Mud Tanks—Fuel Tanks—Circulating Tanks. All necessary tools and pipe for operating rig.

This equipment in first-class condition ready to move on well and start drilling.

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FORT WORTH, TEXAS

EQUIPMENT FOR SALE

FOR SALE: 80,000′ 4½ O.D. S.S. line, 60,000′ 3½ O.D. line, 60,000′ 6⅝ S.S. line. Lundquist Pipe & Supply Co., Phone 5-8850, Tulsa, P.O. Box 1215.

SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma

FOR SALE: 1 Wilson Atlas Draw Works, Serial #6245. 2 G.A.K. Waukesha engines, completely overhauled with all new parts. A-1 condition. Makin Drilling Company, Box No. 1628, Phone 3-3141, Hobbs, New Mexico.

USED ROTARY, cable tools, and production equipment. E. A. Kelly, 3131 S.E. 29th Street, P. O. Box 861, Oklahoma City. Phone Jackson 56407.

N-4 BREWSTER rotary drilling rig, 12″ Gardner-Denver pump w/ NKU Waukesha engine, Lee C. Moore mast, 5½′ Substructure, 5800′ of 3½″ Ext. upset int. flush drill pipe. All purchased new. Has been in use 12 mos. A-1 condition. Write Box 4657, Oklahoma City, or Pho. ME 4-1413.

Stop Frozen Drill Threads!

ARMITE DRILL COLLAR & TOOL JOINT COMPOUND

ARMITE LABS., 6609 Broad St., Los Angeles 1, Calif
A. R. Brousseau, 822 Perdido, New Orleans 12, La.

FOR SALE

4500′ 4″ standard, 2500′ 4½″ standard, 9200′ 6″ standard, in single and double random lengths, plain end, all straight, clean, shows no pitting, located Rawlins, Wyoming.

10,000′ 4¾″ O.D. used seamless steel tubing, ⅜″ wall, approx. 28′ lengths, plain end, located near Chicago.

We carry large quantities of used seamless steel boiler tubing from 1⅛″ O.D. to 5½″ O.D. suitable for high pressure oil, gas and water lines, all straightened, cleaned inside and out, shows practically no pitting, all tested for 1000# hydrostatic pressure at our plant before shipment.

Also large quantities of new and guaranteed used steel pipe and tubing up to 36″ in diameter in lightweight, standard and extra strong.

All for immediate shipment. Please phone or wire collect.

A. GREENSPON PIPE CO., INC.
50 South Bemiston Avenue
St. Louis 5, Missouri
Phone: PArkview 6885

Large Diameter NEW STEEL PIPE

24″ O.D. .281 wall 6,000 feet

28″ O.D. .281 wall 8,000 feet

30″ O.D. .500 wall 5,000 feet

All 40 foot lengths

Small size pipe and tubing also available

Submit your requirements

Write—Wire—Phone

SONKEN-GALAMBA CORPORATION

2nd and Riverview (X-960)
Kansas City 18, Kansas
ATwater 9305

EQUIPMENT FOR SALE

OIL COMPANY for sale; income approx. $20,000.00 per mo. Also Denver-Julesburg basin drilling deals. Box 115 or Phone 345, Brush, Colorado.

WE OFFER: Two casing pulling units—Hydraulic operated—in A-1 condition—together with two pickup trucks 1950 and 1952 models and two heavy metal tool houses and one circulating unit. Pipe Pulling, Inc., Stafford, Kansas.

S33 WALKER-NEER SPUDDER, used 45 days, new condition, 6000 feet drilling or 7000 feet workover, tandem trailer mounted, power take-off mounting for Guiberson Drilling Head, 87 foot poles with double board for standing back of tubing, hydromatic brakes, with or without 5 and 7 inch tools, 3 inch kelly, swivel, etc. Bare rig—$29,000.00. Extra rotary and cable tools at depreciated discount. Contact C. A. Hurst—Phone 20808; A. B. Vaught—Phone 22088; C. A. Hurst—Phone 33209, all of Midland, Texas.

FOR SALE: 60,000 4½ o.d. s.s. line, 60,000 3½ o.d. line, all new. 60,000 6⅝ seamless line, No. 1 s.h. 2 8,000 and 5 5,500 bbl. tanks. Lundquist Pipe & Supply Co. Phone 5-8850, Tulsa, Okla. P. O. Box 1215.

FOR SALE: In Oklahoma and Kansas approximately 9 miles 2″, 11 miles 3″, 10 miles 4″, 10 miles 6″, and 6 miles of 7″, lapweld used plain end, plain end beveled, and T&C used line pipe. Complete list furnished upon request. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

USED 4½″ and 3½″ Sonoscoped Drill Pipe, Casing, Tubing, Rotary and Cable Tool Rigs and production equipment. Giffin & Thompson Supply, Hoisington, Kansas. Tel. 477.

FOR TRADE: Cardwell Oil Well Service Unit complete. What have you? J. L. Chew, Lyons, Kansas.

FOR SALE: 1951 Chevrolet tank truck with 100 bbl. Freuhauf trailer. 1950 451-G.M.C. with 118 Bbl. Star Tandem Transport. One International K-L with 111 Bbl. Columbia Tandem Transport. Above Trucks are equipped with 3″ Viking Pumps and 3″ Hose. Also: 2—40 Hp. Bettis Boilers mounted on 2 ton Trucks. 1—40 Hp. Bettis Boiler in Skid House. This equipment is in excellent condition, and will be priced upon request. Rankin Oil Well Servicing Company, Box 249, or Telephone 230, Rankin, Texas.

NEW LEE C. MOORE 100′ Cantilever Mast for sale. 18′ x 40′ 9″ base. 510,000#. Herman Graham Drilling Co., Salem, Ill.

FOR SALE

Complete National 100 Rig including 3 PTD-6 Superior Diesel Engines with dual fuel equipment, 136′ Lee C. Moore Mast with 8′ substructure, 2 C-350 Ideal Power Pumps, Ideal Type 548 TC Traveling Block, Type R3 Swivel, and Type MS-20½ Rotary Table. Excellent condition, priced reasonable, located in Montana. Complete inventory upon request.

Box G-341

The Oil and Gas Journal,
Tulsa, Oklahoma

FOREIGN
TUBING
CASING
LINE PIPE
Buy NOW
to fill in domestic shortage.
Early shipment direct from mills
in Germany - Japan
A.P.I. Specifications
Mill Agents

Glenn A. Smith & Associates
555 So. Alexandria Ave.
Los Angeles 5, California

EQUIPMENT WANTED

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1383, Tulsa, Oklahoma.

WANTED: Good used late model shot hole drilling rig, 1,000 to 1,500 foot rating, adaptable for air drilling. Also in market for 315 cubic foot Ingersoll-Rand Gyro-Flo air compressor. Box 246, Grants, New Mexico.

NOTICE: We buy, We sell equipment everywhere. If you want to sell or buy, contact Pressey & Son, Pueblo, Colorado.

WANTED—Bolted type steel tanks, new, and if used must be A.P.I. late type having a capacity of 500 bbl. and larger. Also high pressure welded steel tanks 10,000 gal. and larger for propane.

A. GREENSPON PIPE CO., INC., 50 South Bemiston Avenue, St. Louis 5, Missouri. Phone: PArkview 6885.

HELP WANTED

GASOLINE Plant Chief Chemist for water, corrosion, and product control. Graduate preferred but not required if experienced. Excellent salary and opportunity with large progressive independent. Write Box G-514, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEERS

FOREIGN SERVICE

Graduate engineers with good background in general physics, mathematics, mechanics and with some laboratory experience in equipment and techniques. For laboratory position responsible for theoretical experimental studies on reservoir fluid and rocks. Duties will consist of designing equipment, performing or supervising testing and analyzing and reporting results. Studies pertinent to evaluation of primary depletion practices and applicability of secondary recovery for pressure maintenance operation will be required.

Please write giving full particulars regarding personal history and work experience. Please include telephone number.

RECRUITING SUPERVISOR
BOX OG-5
Arabian-American Oil Company
505 Park Avenue
New York 22, N. Y.

GEOPHYSICAL PERSONNEL

Party Chiefs, Computers, Operators, Shooters, Surveyors, wanted by major oil company starting its own geophysical organization.

Write giving personal, educational and experience qualifications, and references. All replies confidential.

Box G-540

THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

HELP WANTED

OIL Industry Employment Service. 405 Tuloma Bldg., Tulsa, Okla. 4-5974. Tom Robinson, owner. For Technical and Trained Personnel, including LPG.

WANTED: Experienced Safety Engineer for oilwell drilling contractor, with nine (9) rotary rigs operating in West Texas and Southeast New Mexico area. In applying, give age, references, and experience. Reply Box G-496, The Oil and Gas Journal, Tulsa, Oklahoma.

TERRITORY now available with first class opportunity for Petroleum Engineer or oil field sales organization to take over exclusive sales of nationally accepted oil field equipment. Commissions are far above average. Our men know of this ad. If interested write P. O. Box 7288, Houston 8, Texas, to arrange interview.

PROCESS ENGINEERS

Engineering contractor has openings which offer excellent opportunities for young Process Engineers with background in chemical, refining, or gas & gasoline industries, for permanent position in office located in Tulsa, Oklahoma. One to five years experience is desirable but college education & willingness to assume responsibility are essential. Applicants should write giving age, resume of experience, education and salary expected. Please address Box G-519, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED

PRODUCTION SUPERINTENDENT
CHIEF PETROLEUM ENGINEER
EQUIPMENT ENGINEER
RESERVOIR ENGINEER
DRILLING ENGINEER
PRODUCTION FOREMAN
GASOLINE PROCESS ENGINEER
ASSISTANT CHIEF GEOLOGIST
SURFACE GEOLOGIST
SUBSURFACE GEOLOGIST
EXPLOITATION GEOLOGIST

For work on DeMares Concession, Colombia, South America. Excellent salary plus substantial income tax savings. Good living conditions. Two year contract. Annual local vacation and paid vacation to United States if contract renewed. Give details of age, education and experience by letter. All replies held confidential. Reply to Box G-516, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED

CHIEF GEOLOGIST

for

Aggressive Independent Oil Company

Operating in Rocky Mountain Area, Mid-Continent, North and West Texas.
Experience in these areas desirable. Give complete details of education and experience by letter in duplicate. All replies held confidential.

Box G-460
THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

HELP WANTED

PETROLEUM ENGRS., GEOLOGISTS, REFINERY MEN; Rocky Mtn. positions with Majors and Independents. Specialists in drilling, production, reservoir, refinery operation. Professional Placement Service, 516 University Bldg., Denver, Colorado.

ENGINEERS, Executives, Technical Men. Salaried positions—$3600 to $30,000. This confidential service for outstanding men who desire a change of connection. Will develop and conduct preliminary negotiations without risk to present position. Send name and address for details. Tomsett Associates, 434 Frick Bldg., Pittsburgh 19, Pa.

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co. Box 2603, Tulsa, Okla. $5.00 cash.

DESIGN ENGINEER: Mechanical Design Engineer with 5 to 8 years experience in design of drilling equipment—specifically draw works, rotary tables, and masts. Progressive expanding company, excellent working conditions and benefits. Salary commensurate with experience. REYNOLDS METALS COMPANY, 2000 S. Ninth Street, Louisville, Kentucky.

A FIRST-CLASS Instrument Man capable of servicing the latest type of instruments on Catalytic Cracking and general refinery processes. Give complete brief of experience and personal data in letter. Delta Refining Company, located at Memphis, Tenn.

MECHANICAL, CIVIL OR PETROLEUM ENGINEERS

Recent Graduates for Field Assignment
Approximately $350 per Month

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1405 Niels Esperson Building, Houston, Texas, or call BL-5531

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for

Electrical Installations

Domestic Petroleum Refinery Construction

Qualified applicants must have accredited college degrees in Electrical Engineering and minimum six years responsible supervisory experience directing electrical operations in petroleum refinery construction.

Applicants must have initiative and qualifications pertinent to correlating designs with job site conditions.

These challenging positions offer excellent salaries plus opportunity for advancement in expanding construction programs.

Applications must include completed detailed chronological history of education (naming schools and colleges attended, degrees received), names of employers (including periods employed, positions held, salary received, nature and location of projects supervised). Name past employer references we are permitted to contact prior to interview.

Applications Are Confidential

Interviews arranged in New York City at our expense. Send complete information requested to

PERSONNEL DEPARTMENT

HYDROCARBON RESEARCH, INC.

115 Broadway New York 6, N. Y.

HELP WANTED

CONTINENTAL Oil Company has several openings for Petroleum Production Engineers in the Rocky Mountain Region. Minimum 3 years' experience required. Also have opening for Mechanical Engineer with oil field experience. Apply to C. C. Frye, Regional Petroleum Engineer, Denver, Colorado.

SALES MANAGER wanted for drilling equipment. Applicants should have field experience. Knowledge of diesel engines desirable. Apply stating age, experience, and salary required to personnel manager Box G-539, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

OFFICE MANAGER, Controller, Executive Assistant desires responsible supervisory position with growing oil company. Rocky Mountain Area preferred. Presently employed by oil refinery on West Coast. Six years extensive experience with emphasis on public and personnel relations with this company. Accounting background. Age 31. Married. Box G-532, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No. 1628, Ph. No. 3-3141, Hobbs, New Mexico.

PETROLEUM Engineer, 36, married. Desires position with major or active independent. Twelve years experience. Production problems; well completions; reconditioning and recompletion recommendations; gas lift; water flood; reservoir studies. Excellent references. Available immediately. Mid-Continent or Rocky Mountains preferred. Box G-530, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST, Gravity experience. M. S. degree. Box G-526, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER, twelve years in refining and petrochemicals is interested in manufacturer's representationship or private venture in Corpus Christi area. Box G-544, The Oil and Gas Journal, Tulsa, Oklahoma.

CORROSION ENGINEER wants promotion. More than ten years experience with major company in Corrosion Control on bare and coated pipe lines. Registered Engineer. Supervisory experience. Capable of organizing and directing a program of Corrosion Control. Box G-543, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—Independently operative in Central and Eastern Oklahoma. Has up-to-date subsurface structural mapping system and records available for checking merit of leased acreage and recommendation of preferred locations for oil exploration. Salary or retainer. Post Office Box 1884, Tulsa.

CHEMICAL ENGINEER—6 years supervision in distillery plant maintenance and production. 1½ years process and operation—low temperature air fractionation. Age 32. Box G-542, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY MANAGEMENT: Eleven years refining experience in technical and operations. Presently employed, assistant plant superintendent. B.S., ChE. Prefer southwest area. Box G-545, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST 8 years experience in oil exploration including interpretation, administration, and geological coordination work. Presently employed directing varied geophysical program in South America. Desires responsible position in oil exploration work in eastern USA. Box G-511, The Oil and Gas Journal, Tulsa, Oklahoma.

Young Executive, thirteen years diversified experience in the Petroleum Industry, with completely integrated independent companies as Chief Accountant, Office Manager, District Manager, and General Manager. Thoroughly familiar with Finance and Organization. Will be available after July 1. Desires a position with a future. Not afraid of work or responsibilities. Box G-535, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

PRODUCTION ENGINEER, aggressive, extensive experience in drilling and production operations. Desire Rocky Mountain location with progressive firm. Box G-512, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN: Age 32. Experienced all phases land work. Wants to join solid progressing company. Prefer West Central Texas but will consider relocating. Available any time for interview. Box G-515, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST with 30 years experience in oil exploration plans change. Now executive with major company. Excellent record, including the discovery of substantial oil and gas reserves at moderate cost. Interested in new connection based on salary combined with either stock option or other incentive plan. Replies invited from principals only. Write Box G-521, The Oil and Gas Journal, Tulsa, Oklahoma.

MAINTENANCE Construction Supervisor, Age 35. Experienced in construction and maintenance of Gasoline Plants, terminating Refinery and Pipe Line. 12 years as a supervisor. Phone G. R. 2-4651, Houston, Texas, or write Box G-534, The Oil and Gas Journal, Tulsa, Oklahoma.

C. P. A. Age 36, heavy public and administrative accounting experience. Experienced in oil and gas accounting and taxation. Desire association with independent operator or small oil company in Houston, Texas. Box G-533, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY Engineer for small independent company, 30-40 years of age, Project Estimating, Design, Drafting. Give detailed experience and salary expected. Box G-536, The Oil and Gas Journal, Tulsa, Oklahoma.

SECY.-STENOG.: Educ., fine health, young in appearance. Widow with adult son. Prefer small office—western Texas; Hobbs, New Mexico; Wichita, Kansas. Box G-537, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, 27, B.S. Geology, Houston University, 1950, 1½ years mud logging experience. Will relocate. Box G-538, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

DRILLING in proven field. ¼ interest available to reputable person. Write today for full details. Box G-541, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASED BLOCK 12,000 acres $1. Acre, 50 cents renewals. 5 year term. This block needs drilling. E. H. Grantham, Ordway, Colo. Phone 9921.

FOR LEASE ½ Oil and Gas 25 acres ½ mile to good well. Timbered Land $1250.00 or 1 year $350.00 per location for timber. F. M. Failey, Louisville, Illinois.

FOR SALE: Large block of ten year leases located in Nebraska's portion of the Salina Basin, Township 23N, Range 6E, Cuming County, Nebraska. Inflammable Gas escaping within 2 miles of leases. Doodles really go into action. Overall Geology indicates basement at about 3000 feet. Contact Twibell and Demaree, 211 North 13th St., Norfolk, Nebraska. Phone 812.

WILL pay cash instantly for leases (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

SE NEW MEXICO—A NEW OIL FIELD

We predict on evidence developed that offset well to S.I. well will open field. Engineering reports gratis to those who value facts. Close in O.R. Ride Royalty & Leases open.

W. J. PETERMAN, GEOLOGIST
1918-1953
Portales **New Mexico**

LEASES ROYALTIES

Producing and Nonproducing
Bought and Sold—Any Area
Inquiries Invited

B. D. BUCKLEY
6635 Delmar Ave., St. Louis 5, Mo.

LEASE AND DRILLING BLOCKS

SEE A. L. Bowles, Rollow Building, Ada, Oklahoma, for drilling deals.

ROYALTIES

WE WILL buy producing or non-producing oil royalties. Standard Security Company, 111 Broadway, New York 6, N. Y.

PRODUCING ROYALTY and overrides for sale. Wire-write-call for particulars. JACK EAGLE, 706 City Natl. Bldg., Okla. City, Okla. REgent 6-7027.

QUICK CASH: Producing royalties, Overrides or Production . . . no delay. Phone 72-4533, Robert L. Kinkaid . . . P.O. Box 26, Tulsa, Oklahoma.

WE WILL BUY

Producing royalties overriding royalties and production, any amount. Submit complete detail information. Confidential.

COMBEST ROYALTY COMPANY
Amarillo Building, Amarillo, Texas

ROYALTIES WANTED
Producing Royalties
High Grade Only
Send Full Particulars
Address

C. C. HARMON
718 World Bldg., Tulsa, Okla.
P.O. Box 2151

PRODUCTION WANTED

HAVE buyers for shallow production. What have you? E. H. Grantham, Ordway, Colo.

RESORTS

MOUNTAIN
GUEST RANCH

Crossbow Ranch in Beartooth wilderness area east of Yellowstone Park may be reserved for your private use. Modern cabins, meals, horses and complete staff provided to insure your comfort and pleasure. Excellent trout fishing in streams and lakes, riding, cool mountain air. Ranch Office: Box 1696, Billings, Montana. Phone 9-7553.

REAL ESTATE

FOR LEASE, Baton Rouge, La. All or part of modern office building, 3 floors and basement, approximately 8,000 square feet each floor, will rent one or more floors. Downtown prestige location, impressive limestone and brick front. Building less than 15 years old. Ample parking. Immediate occupancy. For information write, wire or phone collect C. J. Brown, Realtor, Baton Rouge, La. Phone 2-7781.

155 ACRES on promising structure producing oil and gas wells within ½ mile on north and west new wells being drilled on north. John Harlow, Louisburg, Kansas.

ELECTRICAL CONTRACTORS

Office Phone **Res. Phone**
5-5315 **7-4950**

W. L. RATCLIFF COMPANY
ELECTRICAL CONTRACTORS
Industrial—Commercial—Distribution

W. L. Ratcliff **506 Caddo St.**
P. O. Box 373 **Shreveport, La.**

PRODUCTION WANTED

WANT to buy production in Texas or Oklahoma. Box G-527, The Oil and Gas Journal, Tulsa, Oklahoma.

WANT TO BUY

From Principal Owners Only
At Least 1,000 Bbls. Per Day of
Settled Production
Cash Deal Preferred

Box G-531, The Oil and Gas Journal, Tulsa, Oklahoma

PUBLICATIONS

OUT-OF-PRINT Government Geological Publications and files of Technical Journals our specialty. Inquiries welcomed. CANNER'S (Dept. Ogj), Boston 19, Mass.

Leach Announces Formation Of Insulation Company

The formation of Precision Insulation Co., Inc., has been announced by Gilbert Leach, president. The corporation will provide a complete insulation service for industry in the Gulf Southwest area. The company program will be directed by Leach; J. K. Dixon, vice president and general manager; R. M. Skinner, vice president in charge of construction; Ernest E. Drake, secretary-treasurer.

Leach is also a partner in Metallic Building Co. Dixon was formerly district manager for Kaylo division of Owens-Illinois Glass Co.

Precision will act as distributors for Pabco Products Co., who manufacture "Precision Molded" 85 per cent Magnesias and high-temperature insulations as well as caltherm calcium silicate insulations. Precision is also distributor for Baldwin-Hill mineral-wool products and for Pittsburgh Corning, manufacturers of Foamglas.

Precision headquarters are at Houston.

Westinghouse Air Brake Buys Interest in LeTourneau, Inc.

Westinghouse Air Brake Co. has purchased the earth-moving and related business of R. G. LeTourneau, Inc., including all fixed assets and machinery at Peoria, Ill., Toccoa, Ga., and its interest in the Australian subsidiary for approximately $19,500,000, according to a recent announcement by Edward O. Boshell, president and chairman of the board of Westinghouse Air Brake.

The new business will be operated as the LeTourneau-Westinghouse Co., a subsidiary of Westinghouse Air Brake. No change in personnel is contemplated, and all key executives will remain with the new company.

LeTourneau, who is a pioneer and recognized leader in earth-moving equipment industry, will devote part of his time to LeTourneau-Westinghouse as a consultant on development and research work in this field.

The Vicksburg, Miss., and Longview, Tex., plants will remain with R. G. LeTourneau, Inc., which will continue to operate them and manufacture special products for U. S. Government, land-clearing equipment, cranes, and other products not related to earth-moving.

Ross, Campbell Promoted By Lee C. Moore Corp.

J. H. Ross, of the engineering department of Lee C. Moore Corp., Tulsa, has been promoted to sales engineer

J. H. ROSS

E. A. CAMPBELL

out of the company's Dallas office. E. A. Campbell has been appointed eastern division engineer of the company, and will be in charge of the oil-industry engineering department of the Moore Pittsburgh plant.

Ross joined Lee C. Moore in December 1951, and prior to that time he was with U. S. Bureau of Mines, and Phillips Petroleum Co.

Campbell joined the company's production department in 1933, and from 1945 until the present time he has been in the company's Pittsburgh engineering department.

BJ Service, Inc., Elects W. T. Box Vice President

E. S. Dulin, president of BJ Service, Inc., has reported the election of William T. Box as vice president in charge of operations and development.

W. T. BOX

In 1940 Box joined the service division of Byron Jackson Co. where he later became engineer in charge of jet perforation research and development. Box transferred to BJ Service, Inc., a subsidiary of Byron Jackson Co., formed on May 1, 1952. Before his recent promotion he was assistant to John B. Merritt, BJ Service executive vice president.

LEGAL

U. S. Department of the Interior, Bureau of Land Management, Washington 25, D.C. Notice is hereby given that approximately 179.38 acres of land in T. 13 N., R. 12 W., within the known geologic structure of a producing oil or gas field (undefined) situated in Salt Creek Township, Muskingum County, Ohio, will be offered in two parcels for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre, at 1 p.m., Eastern Standard Time, July 1, 1953, when bids will be opened. Details of the lease offering, how and where to file bids, and a description of the lands may be obtained by addressing an inquiry to this office. Edward Woozley, Administrator.

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